ISSUE 203 MARCH 2011

Better Homes and Gardens®

WOOD®

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Build Your Own Cabinets The Easy Way!

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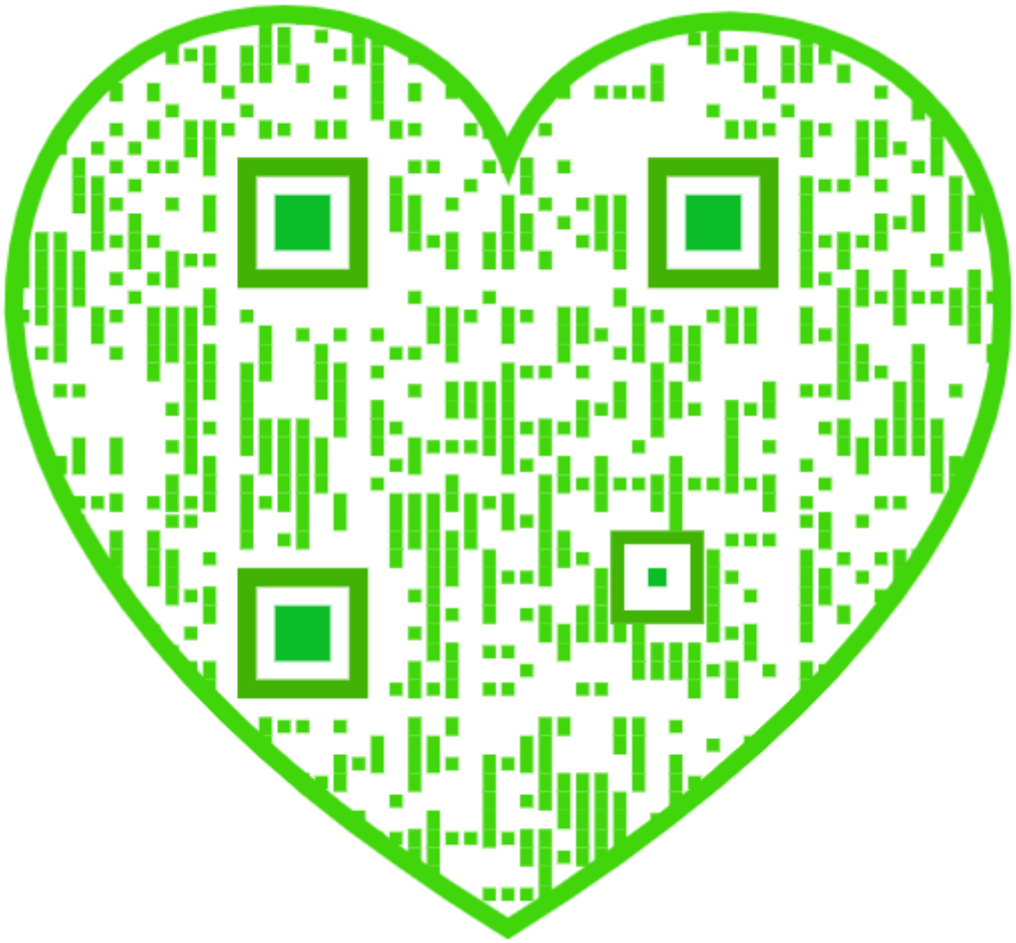

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BEAUTIFUL WHITE COLOR!

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- Precision ground cast iron table with wings measures: 27" x 40"
- Arbor: 5/8" • Arbor speed: 3850 RPM
- Capacity: 3 1/8" @ 90°, 2 3/16" @ 45°
- Rip capacity: 30" R, 12" L
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- Cast iron trunnions
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17" HEAVY-DUTY BANDSAW

BEAUTIFUL WHITE COLOR!

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- Motor: 2 HP, 110V/220V, single-phase, TEFC
- Precision ground cast iron table size: 17" sq.
- Table tilt: 10° L, 45° R
- Cutting capacity/throat: 16 1/4"
- Max. cutting height: 12 1/8"
- Blade size: 131 1/2" L (1/8" - 1" W)
- Blade speeds: 1700 & 3500 FPM
- Quick release blade tension lever
- Approx. shipping weight: 342 lbs.

Product Reviews & Awards ONLINE grizzly.com

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G0513 H-D 17" BANDSAW ~~$850.00~~ **ONLY $795.00**

10" LEFT-TILTING CONTRACTOR-STYLE TABLE SAW *with Riving Knife*

- Motor: 1 3/4 HP, 110V/220V, single-phase
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- Capacity: 3 1/8" @ 90°, 2 1/4" @ 45°
- Rip capacity: 36" R, 12" L • Approx. shipping weight: 342 lbs.

FREE 10" CARBIDE-TIPPED BLADE

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- Precision ground cast iron table size with wings: 27" x 48"
- Arbor: 5/8"
- Cutting capacity: 25 5/8" R, 8" L
- Max. depth of cut: 3" @ 90°, 2 1/8" @ 45°
- Approx. shipping weight: 546 lbs.

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G1023RLW *3 HP* **ONLY $1175.00**

G1023RLWX *5 HP* **ONLY $1295.00**

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- Motor: 3 HP, 220V, single-phase
- Precision ground cast iron table
- Table size with extension: 27" x 74 3/4"
- Arbor: 5/8" • Arbor speed: 4300 RPM
- Max. depth of cut: 3 1/8" @ 90°, 2 3/16" @ 45°
- Max. rip capacity: 50"
- Max. dado width: 13/16"
- Approx. shipping weight: 572 lbs.

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14" BANDSAW

- Motor: 3/4 HP, 110V/220V, single-phase, TEFC
- Precision ground cast iron table size: 14" sq.
- Table tilt: 15° L, 45° R
- Cutting capacity/throat: 13 1/2"
  - Max. cutting height: 6"
  - Blade size: 92 1/2" - 93 1/2" L (1/8" - 3/4" W)
- Blade speed: 3000 FPM
- Cast iron frame
- Steel open frame stand
- Approx. shipping weight: 165 lbs.

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ULTIMATE 14" BANDSAW

New!

- Motor: 1 HP, 110V/220V, single-phase, TEFC
- Precision ground cast iron table size: 14" sq.
- Table tilt: 10° L, 45° R
- Cutting capacity/throat: 13 1/2"
- Max. cutting height: 6"
- Blade size: 92 1/2" - 93 1/2" L (1/8" - 3/4" W)
- Blade speeds: 1500 & 3200 FPM
- Approx. shipping weight: 196 lbs.

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EXTREME SERIES

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- Precision-ground cast iron table size: 26 3/4" x 19"
- Table tilt: 5° L, 45° R
- Cutting capacity/throat: 18 1/4"
- Max. cutting height: 12"
- Blade size: 143" L (1/8" - 1 1/4" W)
- Blade speeds: 1700 & 3500 FPM
- Approx. shipping weight: 460 lbs.

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12" JOINTER/PLANER COMBINATION MACHINE

New!

BEAUTIFUL WHITE COLOR!

- Motor: 5 HP, 220V, single-phase
- Jointer table size: 14" x 59½"
- Cutterhead dia.: 3⅛"
- Cutterhead speed: 5034 RPM
- Max. jointer depth of cut: ⅛"
- Max. width of cut: 12"
- Planer feed rate: 22 FPM
- Max. planer depth of cut: ⅛"
- Max. planer cutting height: 8"
- Planer table size: 12¼" x 23⅛"
- Approx. shipping weight: 734 lbs.

NEW END-MOUNTED FENCE

CARBIDE INSERT SPIRAL CUTTERHEAD!

FREE SAFETY PUSH BLOCKS

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G0634XP INTRODUCTORY PRICE **$2195.00**

ALSO AVAILABLE

G0633 JOINTER/PLANER $1995.00 **ONLY $1795.00**

G0634Z SPIRAL CUTTERHEAD MODEL $2495.00 **ONLY $2295.00**

CYCLONE DUST COLLECTOR

BEAUTIFUL WHITE COLOR!

- Motor: 1½ HP, 110/220V, single-phase, TEFC, 3450 RPM
- Air suction capacity: 775 CFM
- Static pressure at rated CFM: 1.08"
- Intake port: 6" with included 5" optional port
- Impeller: 13½"
- Height: 68½"
- Built-in remote control switch
- Approx. shipping weight: 210 lbs.

New!

PLEATED FILTER IS PROTECTED BY A STEEL CAGE

FULLY MOBILE WITH BUILT-IN CASTERS

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G0703P INTRODUCTORY PRICE **$695.00**

8" JOINTERS

- Motor: 3 HP, 220V, single-phase, TEFC
- Precision ground cast iron table size: 9" x 72½"
- Max. depth of cut: ⅛"
- Max. rabbeting depth: ½"
- Cutterhead dia.: 3"
- Cutterhead speed: 5000 RPM
- Cuts per minute: 20,000
- Approx. shipping weight: 500 lbs.

New!

FREE SAFETY PUSH BLOCKS

BUILT-IN MOBILE BASE

CHOOSE EITHER 4 HSS KNIVES OR SPIRAL CUTTERHEAD MODEL

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12" x 60" SHORT BED JOINTER *with Spiral Cutterhead*

- Motor: 3 HP, 220V, single-phase, TEFC
- Precision ground cast iron table size: 13" x 60"
- Fence: 5⅜" x 31¼"
- Cutterhead dia.: 3¾"
- Cutterhead speed: 4,950 RPM
- Bevel jointing: 45°, 90°, 135°
- Max. depth of cut: ⅜"
- Approx. shipping weight: 832 lbs.

MADE IN ISO 9001 FACTORY!

FREE SAFETY PUSH BLOCKS

PARALLELOGRAM TABLE ADJUSTMENT

G0706 **ONLY $2195.00**

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15" PLANERS

New!

- Motor: 3 HP, 220V, single-phase
- Precision ground cast iron table size: 15" x 20"
- Min. stock thickness: 3/16"
- Min. stock length: 8"
- Max. cutting depth: ⅛"
- Feed rate: 16 FPM & 30 FPM
- Cutterhead speed: 5000 RPM
- Approx. shipping weight: 660 lbs.

BUILT-IN MOBILE BASE

CHOOSE EITHER 3 KNIFE OR SPIRAL CUTTERHEAD MODEL

G0453P INTRODUCTORY PRICE **$995.00**

$139 Shipping ANYWHERE IN LOWER 48 STATES

WITH SPIRAL CUTTERHEAD

G0453PX INTRODUCTORY PRICE **$1475.00**

10" DRUM SANDER

New!

- Motor: 1½ HP, 110V, single-phase
- Conveyor motor: 1/10 HP
- Drum speed: 2300 FPM
- Drum size: 5⅛" x 10"
- Max. sanding width: 10"
- Max. workpiece height: 2 15/16"
- Min. workpiece height: 3/16"
- Variable feed speeds: 1-10 FPM
- 4" dust port
- Approx. shipping weight: 220 lbs.

WHEELS & STOWABLE TRANSPORT HANDLES FOR MOBILITY

REMOVABLE HEADSTOCK SUPPORT BRACKET ALLOWS SANDING UP TO 20"

G0716 INTRODUCTORY PRICE **$345.00**

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15" DISC SANDER *with Stand*

New!

- Motor: 1½ HP, 220V, single-phase, 1720 RPM
- Cast iron sanding disc size: 15"
- Cast iron table size: 12" x 20"
- Table tilt: 0 - 45°
- Floor to table height: 37⅝"
- Dust port: 2½"
- Approx. shipping weight: 232 lbs.

INCLUDES MITER GAUGE

MADE IN TAIWAN

FEATURES BUILT-IN MOTOR BRAKE & STORAGE CABINET WITH SHELF

G0719 INTRODUCTORY PRICE **$795.00**

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1 HP WALL MOUNT DUST COLLECTOR

- Motor: 1 HP, 110V/220V,single-phase
- Amps: 14/7
- Intake size: 4"
- Bag size (dia. x depth): 13½" x 24"
- Balanced steel, radial fin impeller
- Air suction cpacity: 450 CFM
- Max. static pressure: 7.2"
- Approx. shipping weight: 51 lbs.

SPECIAL WALL MOUNT DESIGN!

New!

EASY MOUNTING WALL BRACKET & LOCKING THUMB SCREW SECURES DUST COLLECTOR IN PLACE!

G0710
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10" TABLE SAWS with Riving Knife

- 3 HP, 220V, single-phase motor
- Cast iron table size: 27" x 40¼"
- Max. rip capacity: (W1819) 29½", (W1820) 50"

Free 10" Carbide-Tipped Blade

W1819 10" Table Saw
W1820 10" Table Saw w/Long Ext. Table

New

SLIDING TABLE and ROUTER TABLE ATTACHMENTS for W1819 & W1820

SAW NOT INCLUDED

New

W1821 SLIDING TABLE ATTACHMENT

- Industrial grade anodized aluminum table size: 47" x 9"
- Max. cross cut: 48"

W1822 ROUTER TABLE ATTACHMENT

- Precision ground cast iron table size: 27" x 20"
- Universal router mount

3 HP LOW PROFILE CYCLONE DUST COLLECTOR

New

- Motor: 3 HP, 220V, single-phase, TEFC class "F", 3450 RPM
- Air suction capacity: 1489 CFM
- Filter: 0.2-2 microns
- 55 gal. steel collection drum with casters

Only 80" Tall!

W1816 Cyclone Dust Collector

VARIABLE SPEED PLANER/MOULDER with Stand

New

- Motor: 2 HP, 220V, single-phase
- Precision ground cast iron table with wings: 36¼"L x 10"W
- Max. cutting width: 7"
- Max. planing height: 7½"
- Max. moulding depth: ¾"

We also carry an extensive selection of moulding knives for this machine!

W1812 Planer/Moulder

10" SLIDING TABLE SAW

New

- 5 HP, 220V, single-phase motor
- Precision ground cast iron table measures 47" x 40" with extension
- Sliding table measures 63" x 12¼"

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Scoring blade eliminates cross grain tearout!

W1811 10" Sliding Table Saw

8" JOINTER with Parallelogram Adjustable Beds

- 3 HP, 220V, single-phase, TEFC motor
- Precision ground cast iron parallelogram design table measures 8" x 76⅝"
- Cutterheads: (W1741) 4 HSS knives (W1741S) spiral

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W1741 8" Jointer
W1741S with Spiral Cutterhead

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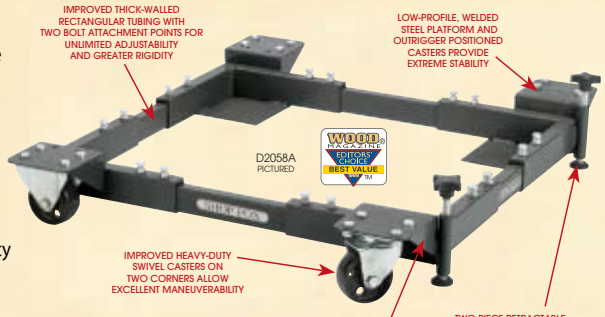
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D2057A Heavy-Duty Mobile Base 700 lb. capacity

D2058A Super Heavy-Duty Mobile Base 1300 lb. capacity

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W1227 Carbide jig for 8" - 14" jointers w/carbide or HSS knives
W1228 Carbide jig for 12" - 18" jointers w/carbide or HSS knives

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W1716 Aluma-Classic® Fence w/standard 57" rails
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W1721 79" rails & legs (fence not included)
W1722 Set of 3 powder coated sheet metal wings

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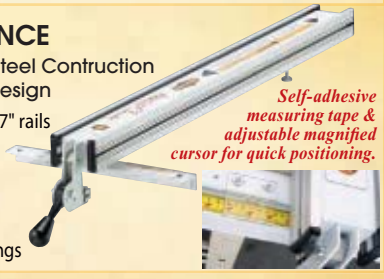

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March 2011 | Vol. 28, No. 1 | Issue No. 203

What's your fondest memory as a young and aspiring woodworker?

Cutting out Christmas ornaments on the bandsaw with my dad. That really got me hooked on woodworking.

Working with my dad, especially the time we made a scrap-lumber boot jack I still have.

Making a walnut wall shelf that went to the state fair for a 4-H project.

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In Memoriam — E.T. Meredith III (1933–2003)

Doug Hicks: When my father let me use his tablesaw unsupervised (in the days before safety guards)!

When I was in high school, a man offered me $400 for a cedar chest I'd made. That experience gave me confidence in my abilities.

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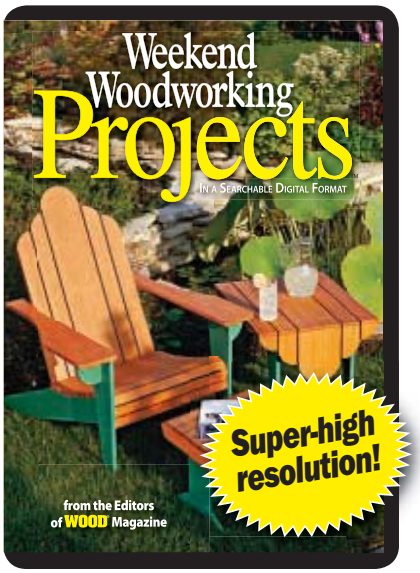

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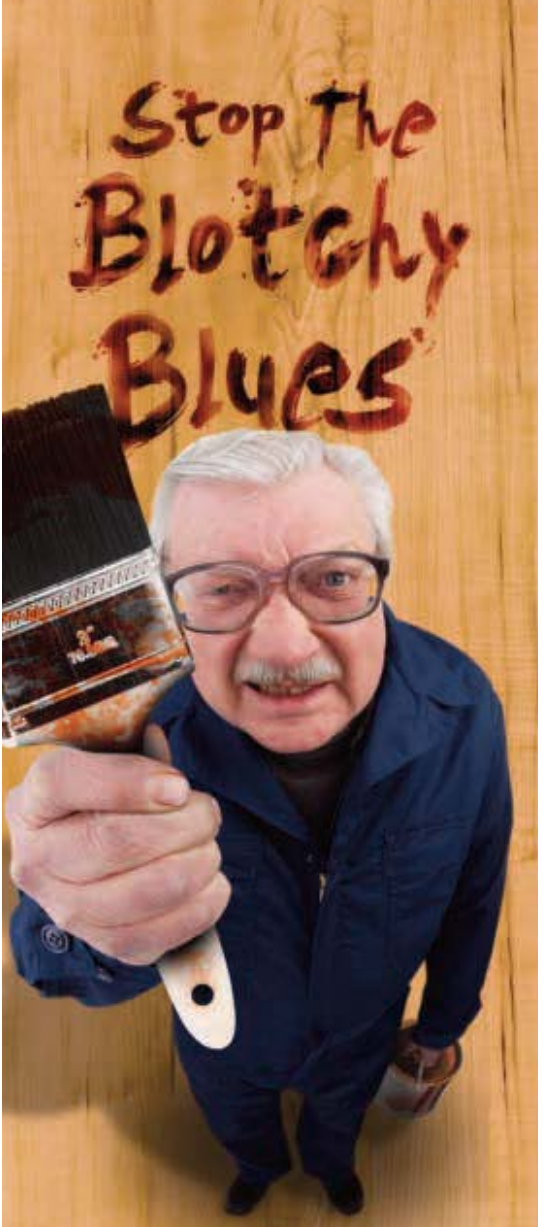

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Editor's Angle

$how me the Money!

You've asked us to list the cost of project materials. Starting with this issue, we're doing just that.

Although many of us took up woodworking as a way to save money, today, most of us build projects purely for the satisfaction of creating something that will last generations, and the pleasure of seeing others enjoy our creations. Still, money matters. No wonder so many of you have asked us to list the cost of materials in the front of project articles. Understandably, you want to know how much to budget before you buy that first board.

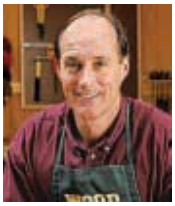
We hear you. In this issue, we list our total material cost of larger, costlier projects, such as the corner curio on *page 38*. There, you'll see that we spent about $420 to build it with mirrors—you *might* spend about $380 to make it with wood panels in place of the mirrors. I stress the word *might* because the cost of materials varies widely depending on where and how you obtain them.

For example, if you're resourceful enough to harvest and dry your own lumber, or salvage it from a torn-down structure, the material costs could drop by up to half. Likewise, using a less-expensive wood than cherry also lowers costs. Let's say you live in an area where a local mill sells boards for less than we pay at our nearby hardwood retailer—again, you save.

So please remember that the costs we show are only ballpark estimates. Your costs can—and certainly will—differ from ours.

I'll be honest with you: Our staff debated long and hard about whether to include these costs. Some were concerned that the expenses would be a turn-off, or that you might be frustrated if you can't find the materials for the same price we did. Ultimately, we decided that readers can't be too informed before embarking on a project. We don't skimp on helpful illustrations, photos, and instructions, so why turn a blind eye to costs?

Please let me know what you think about this new addition to our project articles. The easiest way to reach me is via e-mail at bill.krier@meredith.com.



Bill Krier

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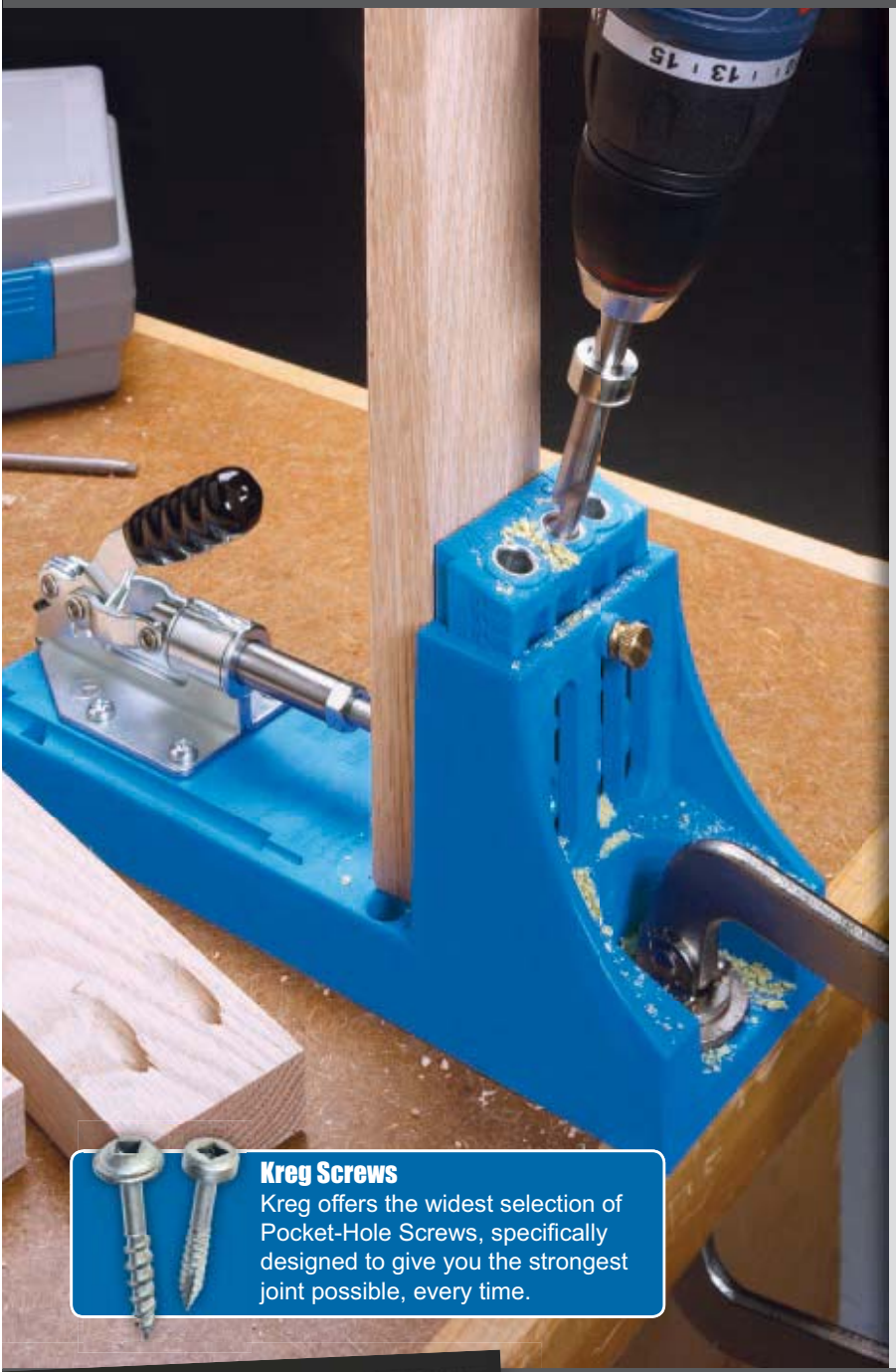

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Sounding Board

Our bulletin board for letters, comments, and timely updates

What's a jewelry box without a ring?

I just wanted to thank you for putting the jewelry box plans in issue 195 (December/January 2009/2010). I built one just like it and used it in proposing marriage to my girlfriend, Kendra.

Here's how it happened. I set up a special table in advance at a restaurant with the finished jewelry box, flowers, and a card. When we arrived that evening, Kendra saw the jewelry box and realized it was a gift I'd made for her. But as she looked it over more closely and found the ring inside, I knelt down beside her and asked her to marry me. (She said yes! We've since gotten married.) This project will always have special meaning to us.

—Joseph Eberle II, Watertown, N.Y.

Finger relief makes tape easier to grab and pull

I made the tape dispenser on page 24 of issue 200 (October 2010), but right away found it was difficult to grab the tape, which sagged below the high sides. So I altered the dispenser by eliminating the dowel and cutting away the sides, as shown at *right*, to form a pleasing curve.

— Richard Durgin, Vienna, Va.

Sharpening technique helps reader see the light

I bought a card scraper 12 years ago, but could never get it to produce the fine shavings other craftsmen were getting with theirs. Even after seeing someone demonstrating a scraper at a woodworking show or reading an article, I could never, to my growing frustration, replicate their results.

But after reading the article on scraper-sharpening in issue 198 (July 2010, p. 28) of *WOOD*® magazine, I got my scraper out and tried again, following the steps as shown in the article. When I took it to a piece of wood, I was astounded that tiny curls sprang up with each push. Finally! Thank you for a great technique that really works.

—Joe Polich, Grapevine, Texas

Watch a FREE video showing how to sharpen a card scraper at **woodmagazine.com/cardscraper**

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—WOOD *magazine editors*

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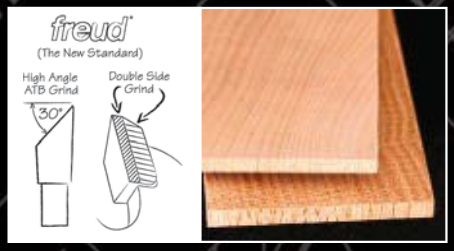

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Shop Tips

Helping you work faster, smarter, and safer

Top Shop Tip

Varied curves from modified fairing sticks

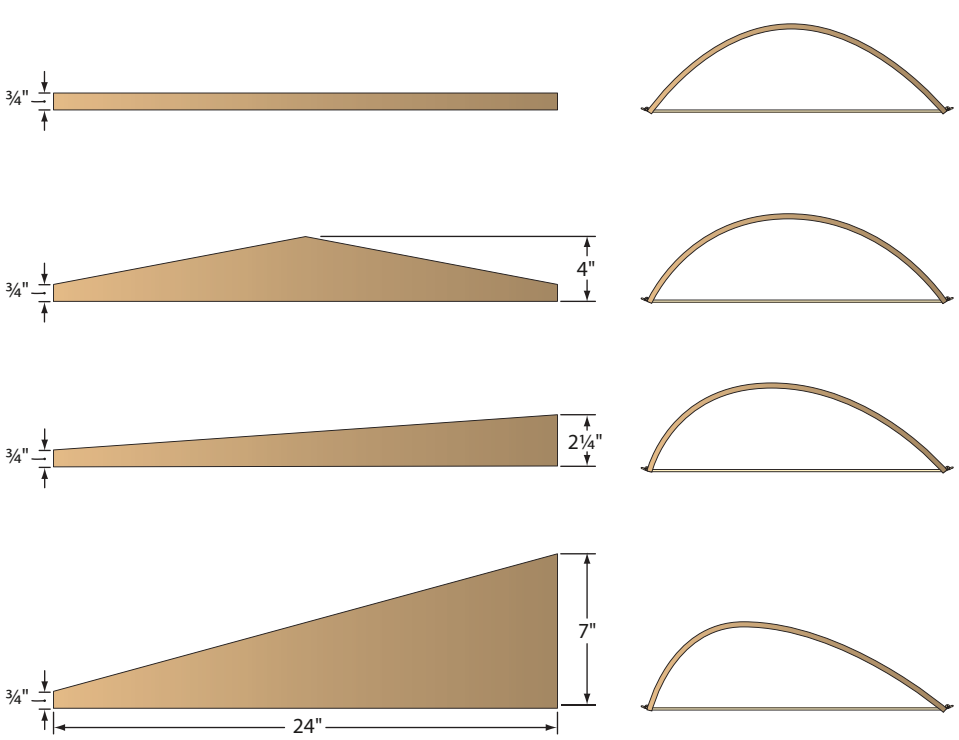
As a high school science teacher, I often experiment in my shop. Recently, I found that varying the height of the traditional fairing stick, as shown in the photo *right*, creates irregular yet controllable curves. That's because the wider parts of the stick resist bending more, resulting in a broader curve there. The illustrations *below* show some fairing-stick shapes and their resulting curves.

The top stick, a traditional same-height fairing stick, results in the parabolic shape shown. But cut the stick wider in the center and you achieve a more circular curve—see second example. The third stick with a slight taper creates an irregular curve. And exaggerating that taper (fourth stick) increases the asymmetry. The variations are endless!

—Tod Jervey, Powell, Ohio

Photo: JasonJosephPhotography.net

To make short work of cutting curves, Tod receives Grizzly's G0555P 14" Bandsaw. Thanks for sending in this issue's Top Shop Tip, Tod!



continued on page 12

Your tips earn cash, tools!

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Send your best ideas, along with photos or drawings and your daytime phone number, to **Shop Tips, WOOD Magazine, 1716 Locust St., LS-221, Des Moines, IA 50309-3023**. Or, by e-mail: shoptips@woodmagazine.com. Include your contact info in the e-mail.

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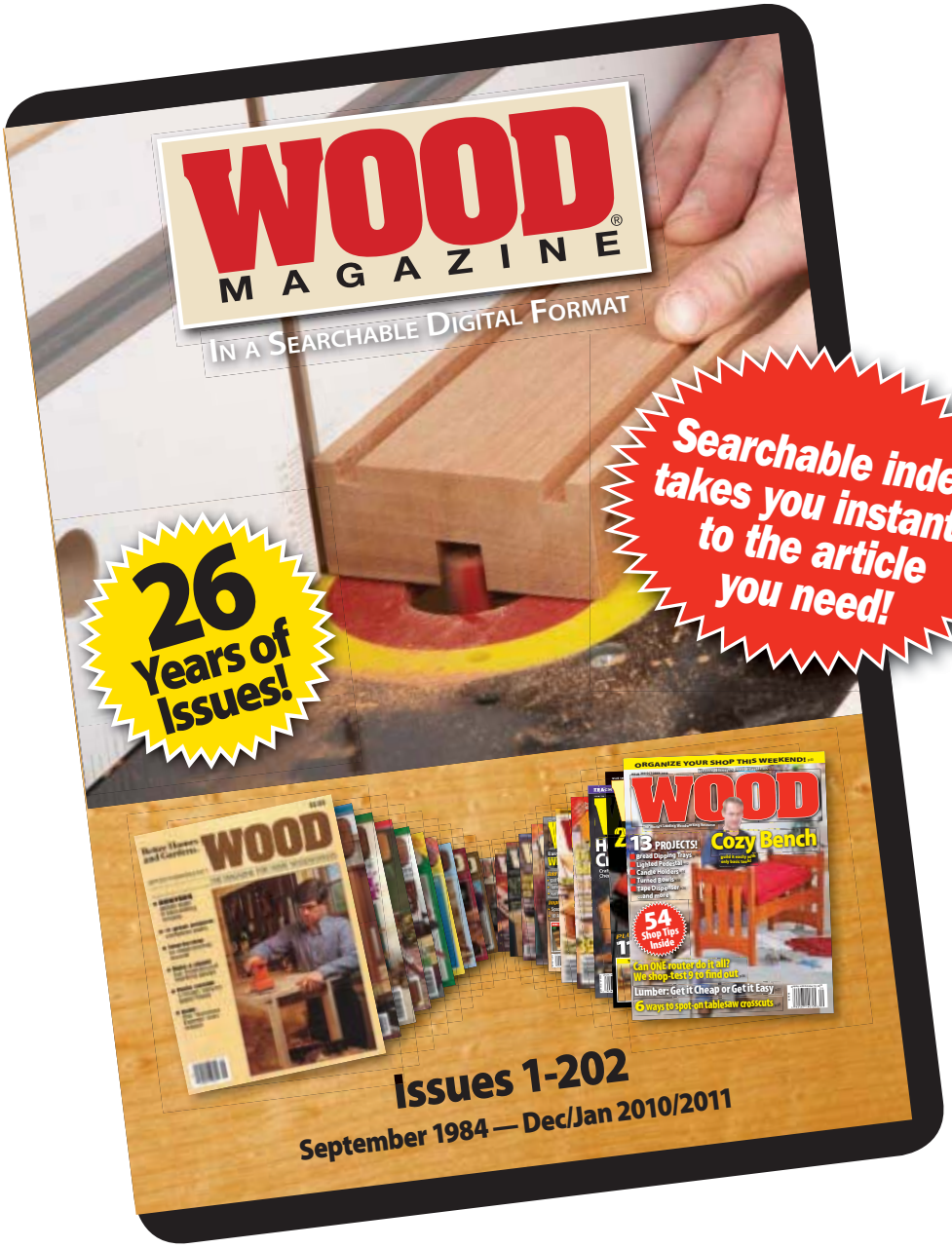
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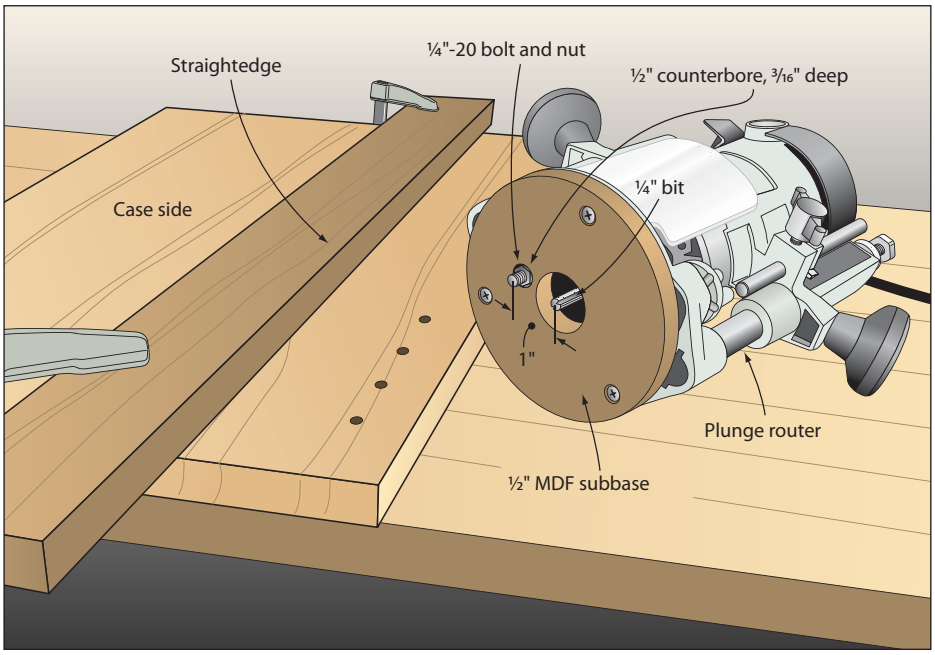
Simple subbase spaces shelf holes equally

Many shelf-pin hole jigs consist of a long board with a line of holes drilled into them: sometimes costly to buy, often time-consuming to make, and always a pain to store. But this router subbase solves all of those problems.

The shop-made subbase (I made mine out of ½" medium-density fiberboard) has a ¼"-20 bolt that acts as an index pin. For shelf pin holes 1" apart, drill a ½" counterbore 3⁄16" deep on the face of the base, centered 1" from the center of the router collet; then a ¼" hole completely through the subbase centered in the counterbore. Countersink the hole on the back of the subbase. Now, insert a ¾" long ¼"-20 flathead bolt, and secure it with a nut inserted in the counterbore. Mount the subbase to your router and install a ¼" straight bit, set for a ¼" plunge depth.

To use the jig, clamp a straightedge to the shelf side to position the bit the desired distance away from the edge of the case. With the base firmly against the straightedge, position the bolt against the end of the case side and plunge the first hole. Slide the router over, positioning the bolt in the first hole. Keeping the router firmly against the straightedge, plunge the second hole. Repeat the procedure, using each preceding hole to index the router for the next.

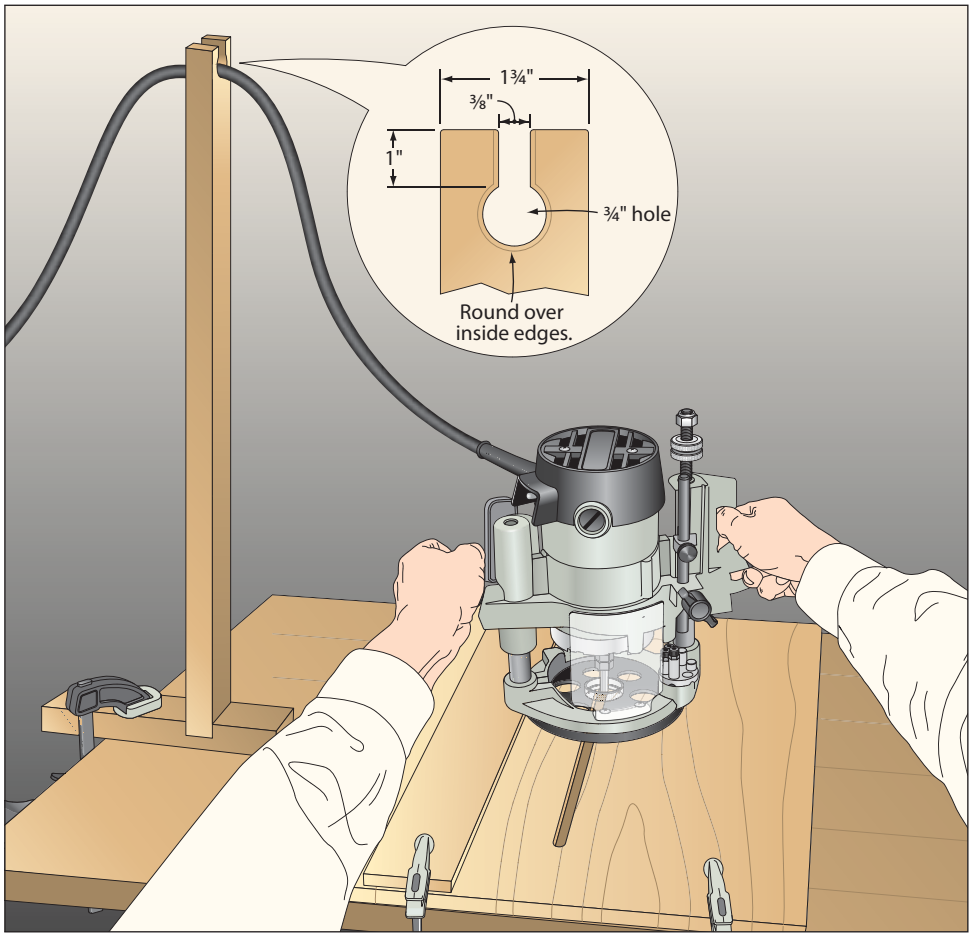
—Bas Pluim, Cary, N.C.



Diagnosis: Cord trouble. Prescription: Elevate it.

For years, I've used my shoulder as a cord manager while routing or sanding. When I finally got tired of the cord slipping into the tool's path or catching on inconvenient corners, I built this cord minder. I drilled and cut a slot in the top, as shown, rounding over the inside edges to ease cord movement. With the cord minder clamped to the bench and the cord draped through the slot, the cord stays elevated and out of the way.

—Raj Chaudhry, New York



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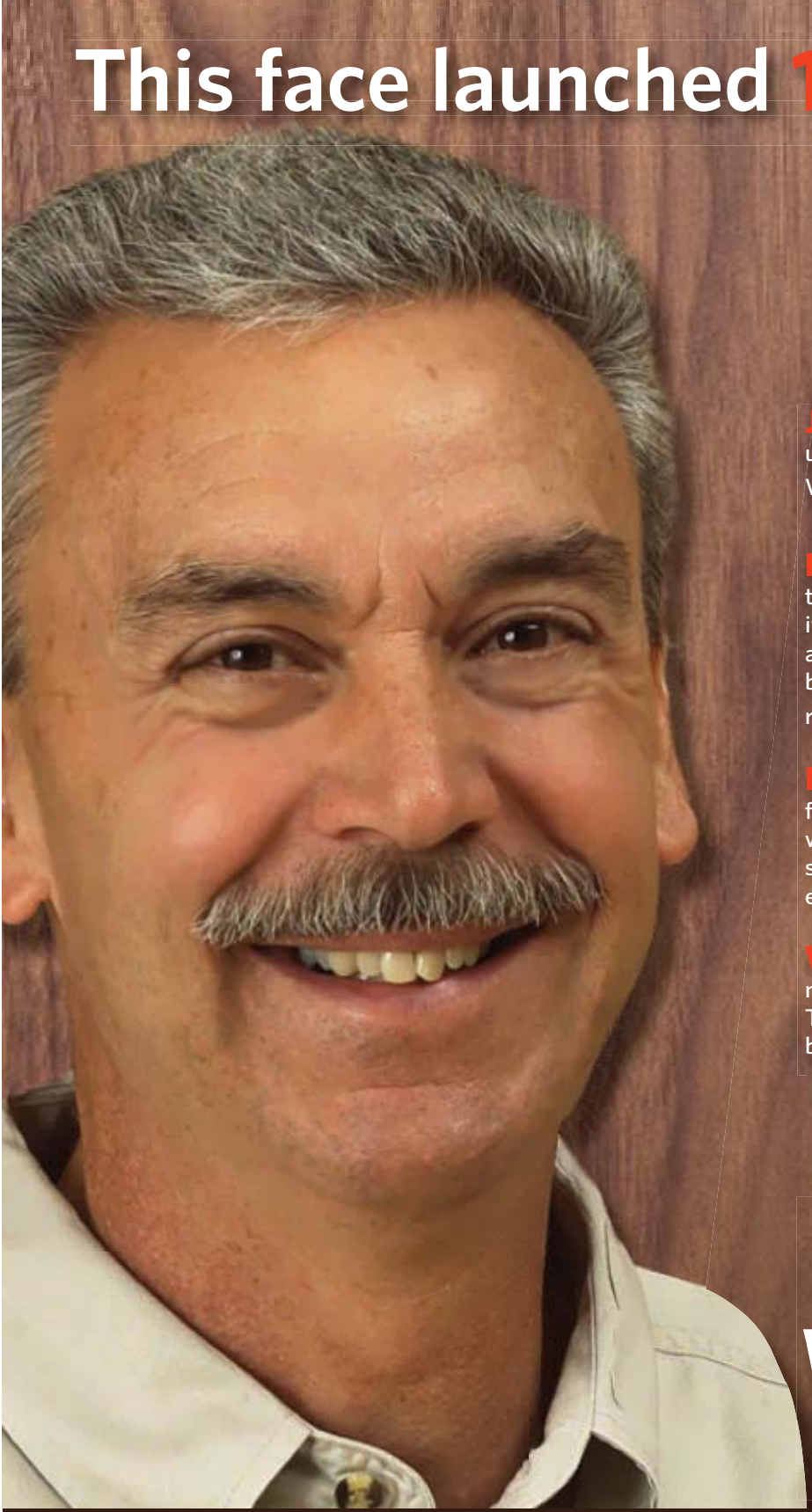

JIM HEAVEY is WOOD Magazine's Contributing Craftsman and a popular educator at The Woodworking Shows.

Favorite Tool: Most woodworkers will say that the table saw is their favorite but, because of its almost limitless versatility, I count my router as one of my top favorites. The more you use and become familiar with it, the more apt you are to reach for it. You'll see more at this season's shows.

Best Project: Bedroom sets that I have made for my children after they celebrate their first wedding anniversaries. I enjoy knowing that something I've made is playing a part in their lives every day.

Working On: Remodeling the lower level of my home. Part of this work will be an "Irish Pub". The project has gotten delayed a couple of times but this time for sure!

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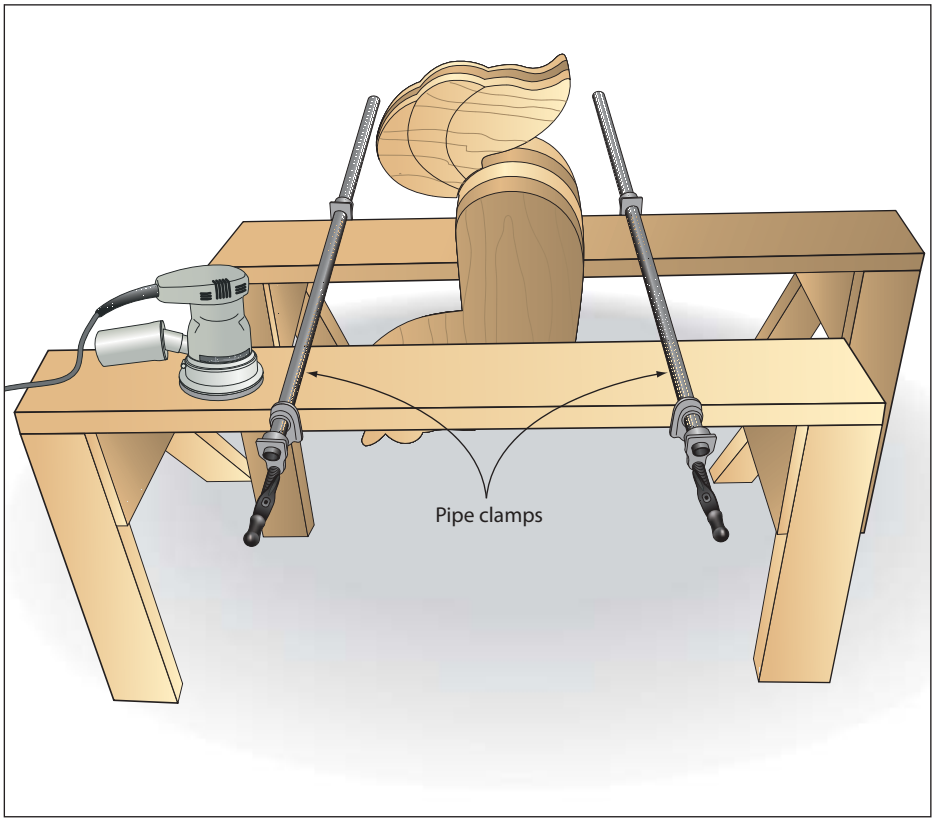
A vise for *really* large workpieces

Some projects, like this rocking horse, are too large for traditional woodworking vises. Instead, simply position the workpiece between two sawhorses and draw the tops together with pipe clamps, locking the oversize workpiece between them.

—Robert Haase, Benson, Minn.



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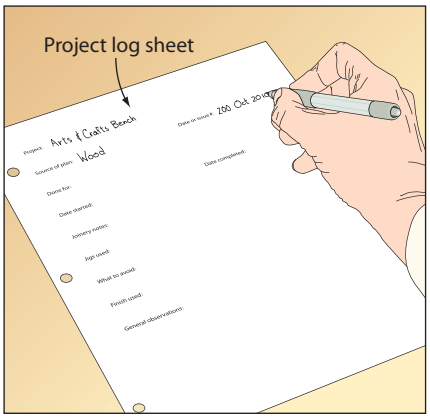
Shop Tips

Project log prevents memory mishaps

Many years ago, my wife suggested that I keep a journal of my projects. The resulting log includes such details as the source of the plans, the project recipient, joinery and finishing notes, jigs used, and "gotchas" to avoid.

This simple form has been extremely helpful over the years. It prevents the duplication of gifts and refreshes my memory if finish repairs prove necessary.

—Lew Zimmer, Bozeman, Mont.

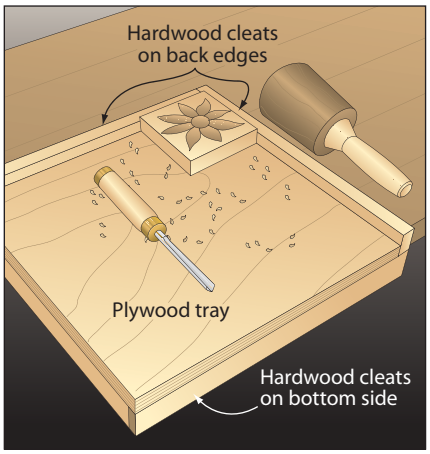


Corner hook gives a better hold on carvings

After more than 30 years of woodworking, I'm finally trying my hand at carving. But instead of investing in an expensive carver's vise, I improvised this handy benchtop carving "hook."

Because the bottom cleats bear on the corner of the bench, you can carve from different angles. And because it's portable, you can take it outside to the picnic table to carve on nice days.

—Serge Duclos, Delson, Que.

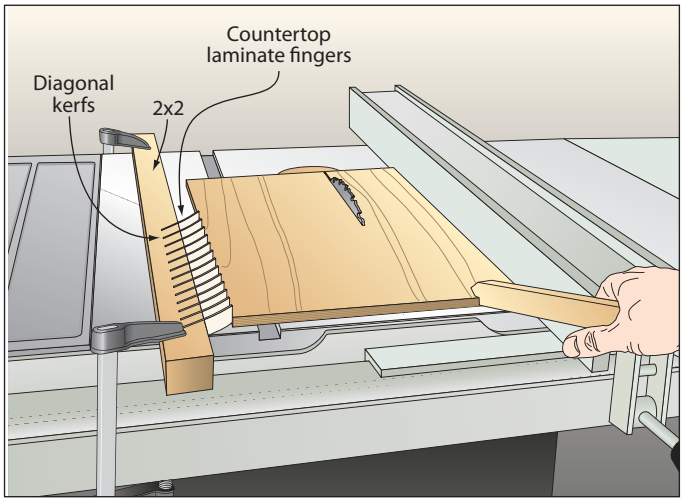


"Feather bar" for working wide pieces

The slot-mounted featherboard that normally guides cuts on my tablesaw doesn't work for cutting wide pieces that cover the miter slot. But this oversize "feather bar" that clamps onto the table does the job nicely.

To make one, bandsaw 45° kerfs in a piece of 2×2 and glue in 1½×3" laminate fingers. If the kerfs are too wide, double up the laminate or add wood spacers. Position the 2×2, with all its fingers in front of the blade and against the workpiece, clamp in place, and cut away.

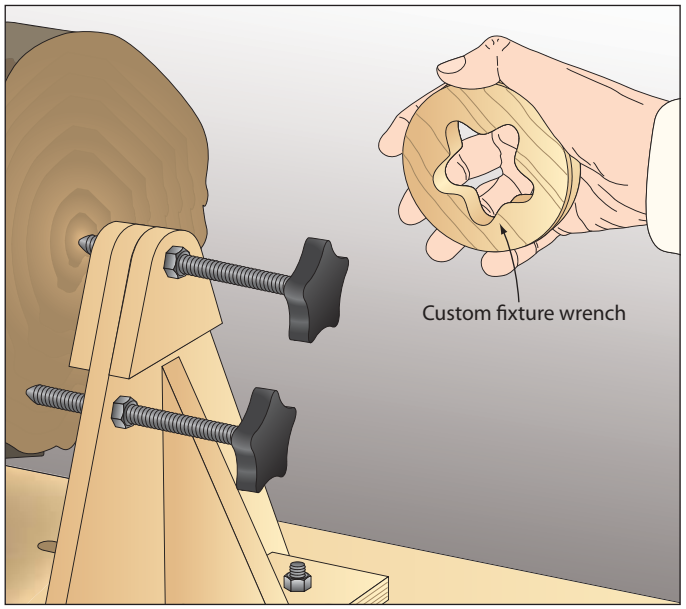
—Bill Wells, Olympia, Wash.



Custom wrench helps you get a grip

If your hand strength isn't what it used to be, try this shop-made wrench for tightening smallish knobs on shop tools and jigs. The larger diameter makes it easy on fingers and increases your leverage. Simply trace the shape of the knob on a scrap of wood and scrollsaw or jigsaw to shape.

—Steven Waskewicz, Elbert, Colo.



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Much easier to make than mortise-and-tenon joints, and a lot stronger than biscuits, trusty old dowels still deserve a place in your joinery arsenal.

Using only basic tools and careful layout, you can assemble dowel joints that rival the strength of mortise-and-tenon joinery, and in less than half the time. In fact, dowels beef up nearly any end-to-end, edge-to-face, and mitered joint.

Doweling jigs range from a simple but nonadjustable $12 jig to the $310 multiadjustable Dowelmax [**Photo A**]. But for less than $60, a self-centering jig with removable drill-guide bushings handles most doweling jobs like the face-frame joints in the dry sink project on *page 54*. You'll also need a brad-point or bullet-point drill bit to match the jig bushings and a countersink wider than the bit.

Although you can buy dowels in ¼", 5/16", ⅜", 7/16", and ½" diameters, the ¼" and ⅜" sizes handle most jobs. (See **Sources**.) Our favorite dowel pins: expandable fluted dowels like those shown in the **Shop Tip** that allow glue to escape through the flutes but swell to firmly grip the holes. Either 1½" or 2" lengths will work; but the 1½" dowels provide ample reinforcement for most joints in ¾"-thick stock.

Make end-to-edge or edge-to-edge joints

For a simple butt-joint, first label your parts. To ensure perfectly mating joints, number the joints 1 through 4 on each piece of a four-sided assembly before marking the dowel locations [**Photo B**].

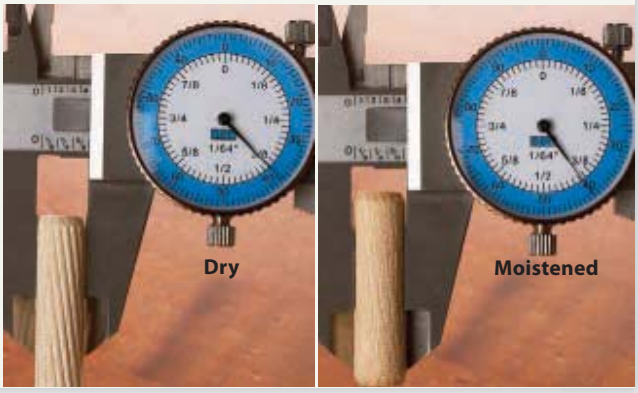
We positioned these marks to center two ⅜" dowels 1¼" apart on 3¼"-wide frame parts. You can add more dowels for increased strength, but avoid spacing them closer than ¼". And leave at least ⅛" of wood between the edge of the dowel hole and any surface of the workpiece.

Next set the drilling depth to half the length of your dowels plus 1/16" to allow for trapped glue. At that distance plus the length of the jig bushing, wrap tape around the bit [**Photo C**].

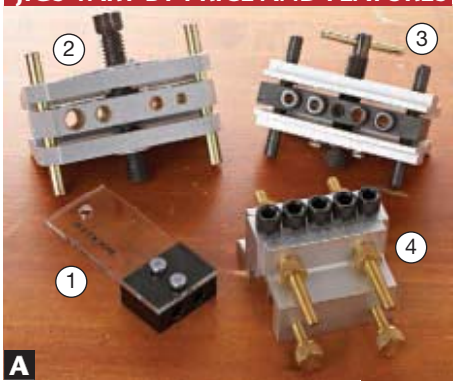
SHOP TIP

Fluted dowels expand to create a solid joint

You could cut your own dowels and score glue-relief grooves in the sides, but you'll save time using commercially available dowels. Like pressed-beech biscuits, the compressed wood in these ⅜" dowels expands about 1/32" on contact with moisture in the glue, as shown at *far right*, creating a tight fit.

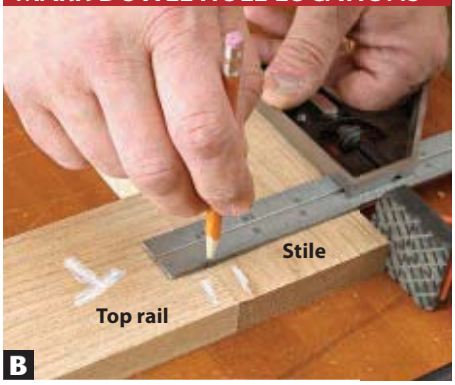


JIGS VARY BY PRICE AND FEATURES



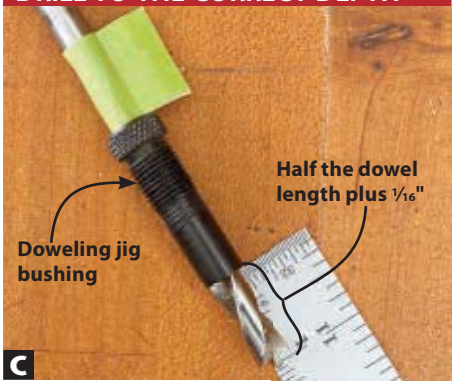
There's a doweling jig for any budget. Shown are jigs from ① Rockler ($12), ② Woodworker's Supply ($36), ③ Lee Valley ($59), and ④ Dowelmax ($310).

MARK DOWEL HOLE LOCATIONS



Make a single fine pencil mark across the stile and rail. The doweling jig will space dowels the same distance apart on both pieces, making a second line unnecessary.

DRILL TO THE CORRECT DEPTH



A self-centering doweling jig's bushing helps determine the correct drilling depth, which we've marked with tape.

continued on page 20

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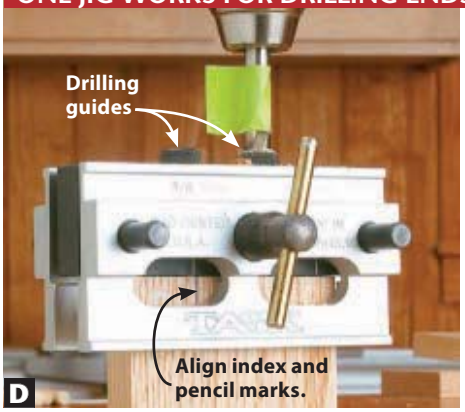
ONE JIG WORKS FOR DRILLING ENDS AND EDGES



You need only one alignment mark to position this drilling jig on a workpiece end (*left*) or edge (*right*). Drilling with the two inside guides spaces holes 1¼" apart.

COUNTERSINK FOR A TIGHT FIT

A 1/16" countersink keeps the hole edges from swelling and pushing the joint apart.

To drill a dowel hole into the end grain of a workpiece, align a self-centering doweling jig index mark over your marked dowel location [**Photo D**]. Then drill two dowel holes to the tape at both ends on each rail.

Now repeat the process on the edge of the mating workpiece [**Photo E**]. Moisture in glue can swell the rims of a dowel hole, pushing the pieces apart. To prevent this, bevel the hole edges with a 1/16"-deep countersink [**Photo F**].

Then glue and insert dowels into either the stiles or rails. Glue the exposed dowels and joint surfaces, tap the parts together, and clamp the joints for one hour.

To make edge-to-edge joints, use the same technique to mark and drill mating edges. Place holes no closer than ⅛" from the ends to avoid breaking out the end grain while assembling the joint.

Join edges to faces

To make edge-to-face joints, start by drilling dowel holes along one edge as described in the previous section. Drill the holes deep enough to make the protruding dowels at least 3/16" shorter than the thickness of the mating piece.

Use dowel centers (see **Sources**) to transfer dowel-hole positions from the edge of one piece to the face of the mating piece. Depending on the size of your dowel centers, either place them in the dowel holes you just drilled, or insert a dowel in each hole and slip them over these dowels [**Photo G**].

To mark the face of the second joint part with the dowel locations from the first one, align the ends of both workpieces using a block. Then tap the face of the second part against the dowel centers [**Photo H**].

Now use a brad-point or Forstner bit in your drill press to drill the mating holes at each location marked by the dowel centers [**Photo I**]. Set the drill-press depth stop for the length of the protruding dowels plus 1/16".

Dry-assemble the joint to test for fit; then carefully disassemble it. Then glue and clamp the pieces.

Sources

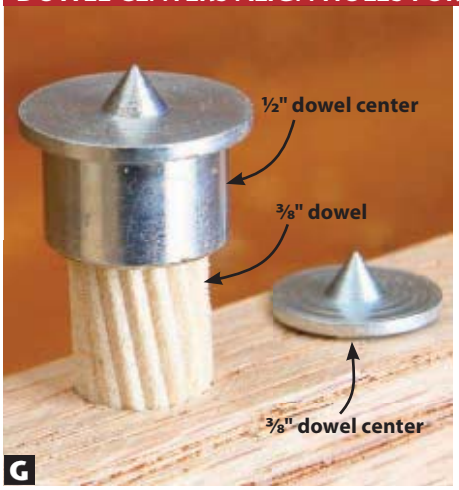
Doweling jigs. ⅜" doweling jig no. 35242, $12, Rockler, 800-279-4441, rockler.com. Self-centering, fixed-bushing jig no. 109-142, $36, Woodworker's Supply, 800-645-9292, woodworker.com. Self-centering doweling jig no. 25K64.01 with interchangeable bushings, $58.50, Lee Valley Tools, 800-871-8158, leevalley.com. Dowelmax Kit with ⅜" bushings, $310, O.M.S. Tool Co., 877-986-9400, dowelmax.com.

Countersinks. Grizzly set of five countersinks no. G5729, $23 from Amazon.com.

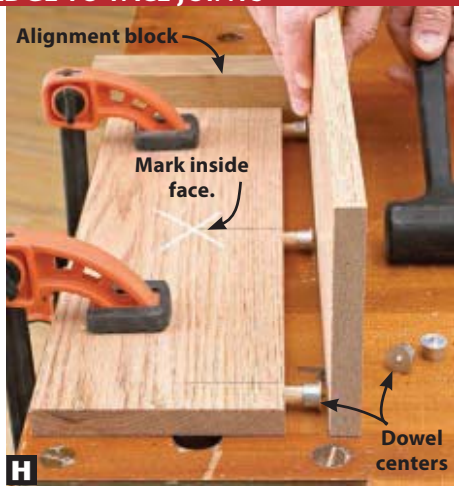
Dowel centers. Each come in packs of 5: ¼" outside, 3/16" inside no. 66J45.01, $2.70; ⅜" outside, 5/16" inside no. 66J45.02, $3.20; and ½" outside, ⅜" inside no. 66J45.03, $4.10; Lee Valley Tools.

Fluted dowels. ¼×1½", $4.89 per pack of 50, Rockler #70342.

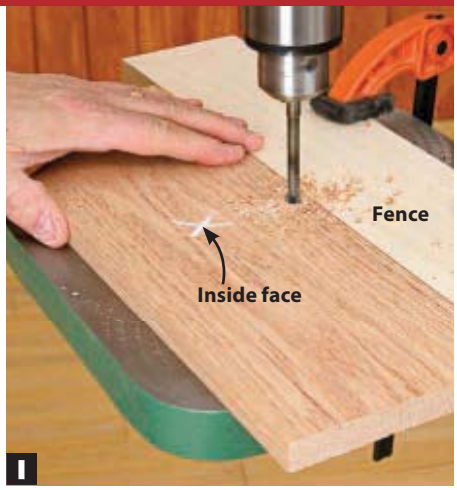
DOWEL CENTERS ALIGN HOLES FOR EDGE-TO-FACE JOINTS



Dowel centers can be placed over the dowels or into the dowel holes. Common dowel center sizes are ¼", 5/16", ⅜", and ½".



Clamp the part with the dowel centers to a flat surface. Then align and tap the mating part to mark the dowel hole locations.



Scrap clamped to the drill-press table acts as a fence for positioning a Forstner or brad-point bit over the dowel-center dimples.

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Small-Scale Spray-Finishing

Airbrushes and touch-up sprayers provide simple, low-cost ways to spray.

If you've given up on the idea of spray-finishing projects because you think it's too messy, too complicated, and too costly for your small and medium-size projects, maybe you're thinking too big. Airbrushes and some small spray guns cost less than HVLP systems and some full-size spray guns. They reduce overspray and vapor problems when finishing small and medium-size projects, and require only a small compressor or just canned compressed air.

Small sprayers come in three types:

Airbrushes, such as the Badger Model 350-4, have nozzles and fluid jars large enough to handle small spray-finishing jobs like jewelry boxes. (See **Sources**.)

Small spray guns, such as the Paasche Model 62-2-3 and the K-Grip Siphon Gun sprayer, hold and spray more finish than airbrushes, but less than most intermediate spray guns.

Touch-up spray guns, such as the Speedaire 4RR06 (**Sources**), handle large projects, such as cabinets and furniture, but they still require less air than full-size spray guns.

Airbrush small projects

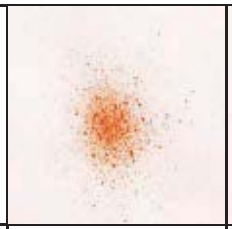
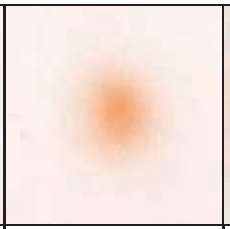
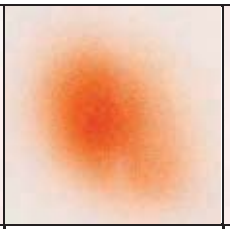
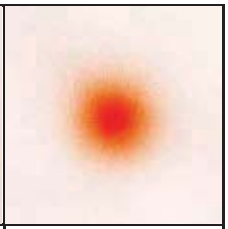
Airbrushes may seem too small to be practical, but they have advantages. There's less overspray waste on small projects or projects with narrow parts, as shown *above*. Despite their diminutive size, airbrushes can shoot light-body stains, thinned and some unthinned lacquers, shellac, thinned varnishes, plus water-based finishes. The material needs to be the consistency of skim milk or thinner.

To handle these finishes, select an airbrush with the largest available nozzle and a container that holds ¾ to 2 oz of material. Choose an external-mix, single-action airbrush that mixes the finish and air outside the body of the airbrush and on which the trigger controls just the release of finish, not finish and air flow.

Next, choose an air source that suits your spraying plans. An airbrush can operate off air sources as simple as a compressed air tank you can refill at a gas station. A light-weight tankless inflater provides a constant air supply, as will portable tank-type air compressors sold at home centers for powering pneumatic nailers.

Before spraying your project, practice on cardboard to adjust the finish viscosity and airbrush settings. If you're using an air compressor, set the pressure reaching the nozzle to 25–30 pounds per square inch (psi). Spray a short burst of finish, and then adjust the fluid flow using your results against the examples shown in the chart *below*. Airbrushes produce a conical spray pattern that can be narrowed by holding the airbrush closer to your work and reducing the fluid flow.

How to read an airbrush pattern

Pattern				
Problem	There's too little air for the thickness of the finish and nozzle size, producing these splatters.*	You're spraying too little material, which produces a rough, dusty-looking surface.	Spraying too much material produces a hot spot and runs at the center of the pattern.	No problem here. Balanced finish and air flows produce a focused, even pattern.
Solution	Increase the air pressure in 5-lb increments, or thin the finish to compensate for low air pressure.	Adjust the nozzle to draw more finish. Switch to a nozzle with a larger opening, if needed.	Adjust the nozzle or lower the air pressure to release less finish, or spray farther from the worksurface.	

* We tinted water-based finish to demonstrate different airbrush settings.

continued on page 24

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Small guns for larger jobs

For larger projects, consider a small spray gun with greater finish storage capacity and a larger fan pattern than an airbrush but with lower air requirements and less overspray than an intermediate spray gun.

For greater versatility, look for models that allow you to control the fluid flow in addition to regulating the air flow at the compressor, such as the K-Grip Siphon Gun sprayer. By using canning jars to store finish and as the fluid reservoir—coupled with a simple siphon action that mixes air and fluid outside the gun—the K-Grip cleans up quickly.

Small sprayers often call for compressors that generate 3 cubic feet per minute (CFM) or more at 90 psi, although we sprayed small projects with the K-Grip using an air compressor producing just 2.4 CFM. The K-Grip needs as little as 20 psi to spray lacquers and 25 psi for polyurethane.

For spraying water-based finishes, a box fan with a furnace filter taped to the intake side directs odors toward the nearest window.

Just a touch-up larger

Stepping up to a touch-up spray gun gives you more control over the pattern. Unlike airbrushes and some spray guns, touch-up sprayers produce a fan pattern instead of a conical shape. You can dial in a wide fan pattern to spray a cabinet side or tabletop, as shown *above*, or tighten the pattern to finish narrow table legs. Customizing the pattern conserves finish material by reducing overspray.

Two other features of touch-up spray guns also let you work faster: Their greater fluid capacity means less refilling when spraying larger projects, and by using larger nozzle sizes than a small sprayer, heavier-body finishes, such as varnish and shellac, can be sprayed with little or no thinning. That means you can spray two or three heavy coats instead of four or more thin ones.

Unlike full-size spray guns, a touch-up sprayer's 3.5-CFM requirements could be met by a 2.6-gallon portable compressor. Even when touch-up sprayers specify an air source requirement like 3 CFM at 90 PSI, most finishing jobs require far less pressure. Thinning may help a slightly undersized air compressor atomize a finish while reducing air use. Lower air pressure also reduces "bounceback"—droplets of finish that ricochet off the surface you're spraying.

Set up a spray space

The smaller the spray gun, the smaller the work area you'll need. But even a touch-up sprayer can be dialed back to apply water-based finish in a tabletop spray booth made from a large cardboard box.

Whether spraying water-based or flammable finishes indoors, position a fan to draw fresh air into the space, around your workpiece, and toward a window or door without pointing the fan directly at your workpiece. Avoid drawing flammable vapors into the fan motor, where they could be ignited. And wear a respirator made to filter organic vapors.

Then arrange a low-angle light to reflect where your finish lands and call attention to any missed spots. To make small and medium-size projects easier to rotate for spraying, place them on pieces of cardboard or a turntable.

There's a mini sprayer for every job

Sprayer	Finishes and Applications	Comments	Cost
Airbrush	Thinned lacquer and varnish, shellac, water-based finishes, and light-body stains. Use for small projects, such as the dinosaur puzzle on *page 70*.	Look for models that use jars instead of cups. Many come in sets with a hose, wrench, finish jars, and assorted nozzles.	$50–95 (varies with make, model, and kit contents)
Small spray gun	Full-strength lacquer, water-based finishes, shellac, stains. Use on medium-size or larger projects, such as the dry-sink cabinet on *page 54*.	The Critter (shown) has a fluid flow control that the Paasche 62 lacks. Neither lets you alter the conical fan pattern.	$50 for the Critter Model 118; $42 for the Paasche 62-2-3
Touch-up spray gun	Full-strength lacquer, water-based finishes, shellac, varnish, stains. Big enough to handle large projects, such as the corner curio on *page 38*.	Includes controls for fluid and air flow and for the fan pattern. Good for big projects, but more output can mean more overspray problems.	$77 for the Speedaire 4RR06

Sources

Airbrushes: Badger 350-4 set with three nozzles, hose, and two jars, $102 from webairbrushes.com, 888-499-6996. Badger Air-Brush Co., 800-247-2787 or badgerairbrush.com. H-Card model set, $56.50 from Paasche Airbrush, 773-867-9191 or paascheairbrush.com.

Small sprayers: K-Grip Siphon Gun sprayer, $50 from Woodcraft Supply (no. 149425), 800-225-1153 or woodcraft.com. Model 62-2-3, $42 from Paasche Airbrush.

Touch-up spray gun: Speedaire 4RR06, $77 from Grainger, 800-323-0620, grainger.com.

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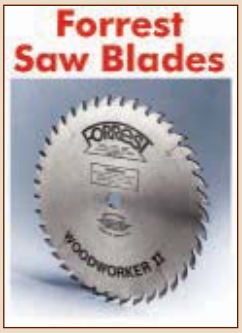

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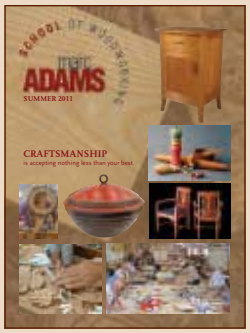

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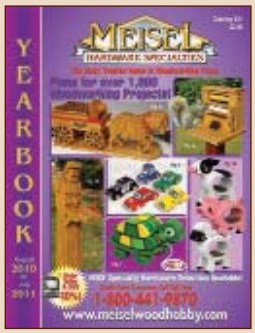

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Clamp this organizer to your workbench with a pocket-hole jig mounted on top and go to work. When you're done, fill the compartments with screws and accessories and hang it up until the next job.

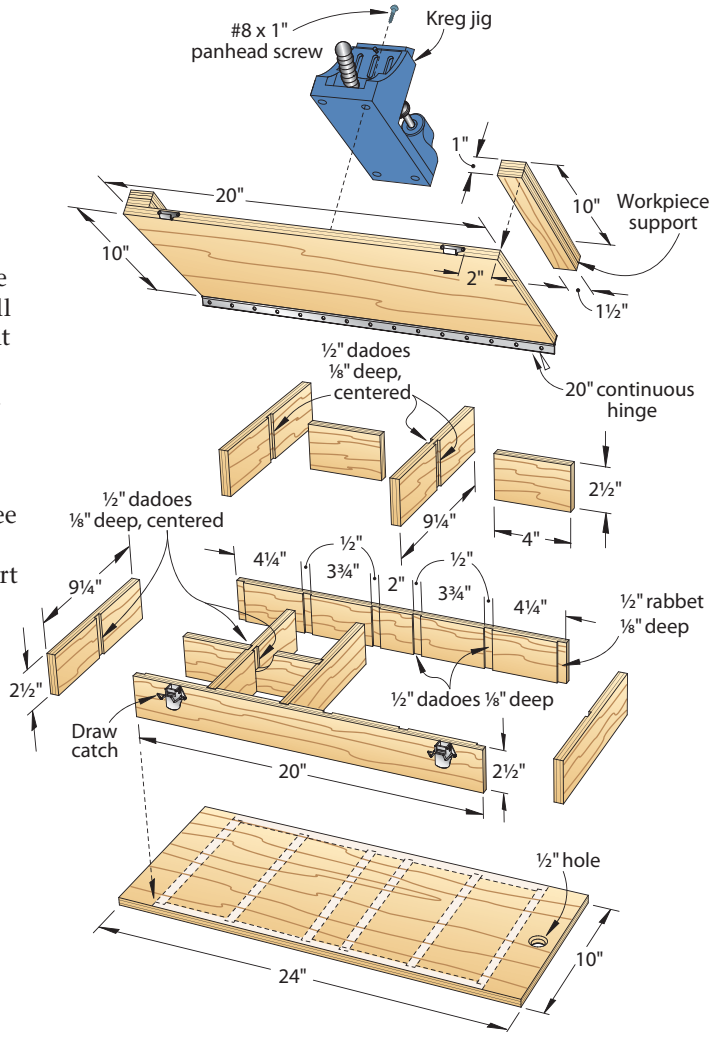
We sized the organizer and workpiece supports to work with a Kreg K4 jig; you may need to adapt the dimensions and workpiece support height to suit your jig. You can cut all the parts from a quarter sheet of ½"-thick Baltic birch plywood. Purchase the continuous hinge at a home center and cut it to 20" long. (See **Source** *bottom* for the draw catches.)

To help choose the right screw for any job, photocopy the chart *below* and attach it inside your organizer with spray adhesive.

Pocket-Hole Screw Guide	
Material Thickness	Screw Length
½"	1"
⅝"	1"
¾"	1¼"
⅞"	1½"
1"	1½"
1⅛"	1½"
1¼"	2"
1⅜"	2"
1½"	2½"

Use fine-thread screws for hardwoods. Use coarse-thread screws for softwoods, MDF, particleboard, and plywood.

Note: All stock ½" Baltic birch plywood



Source

Latches: Nonlocking draw catch no. 1889A34 (2), $4.66, McMaster-Carr, 630-833-0300 or mcmaster.com.

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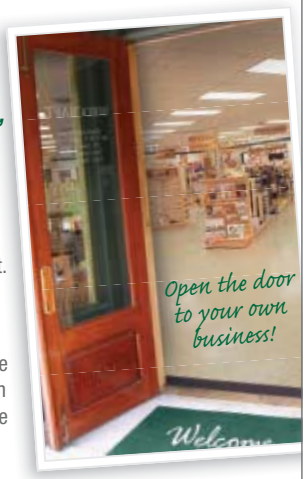

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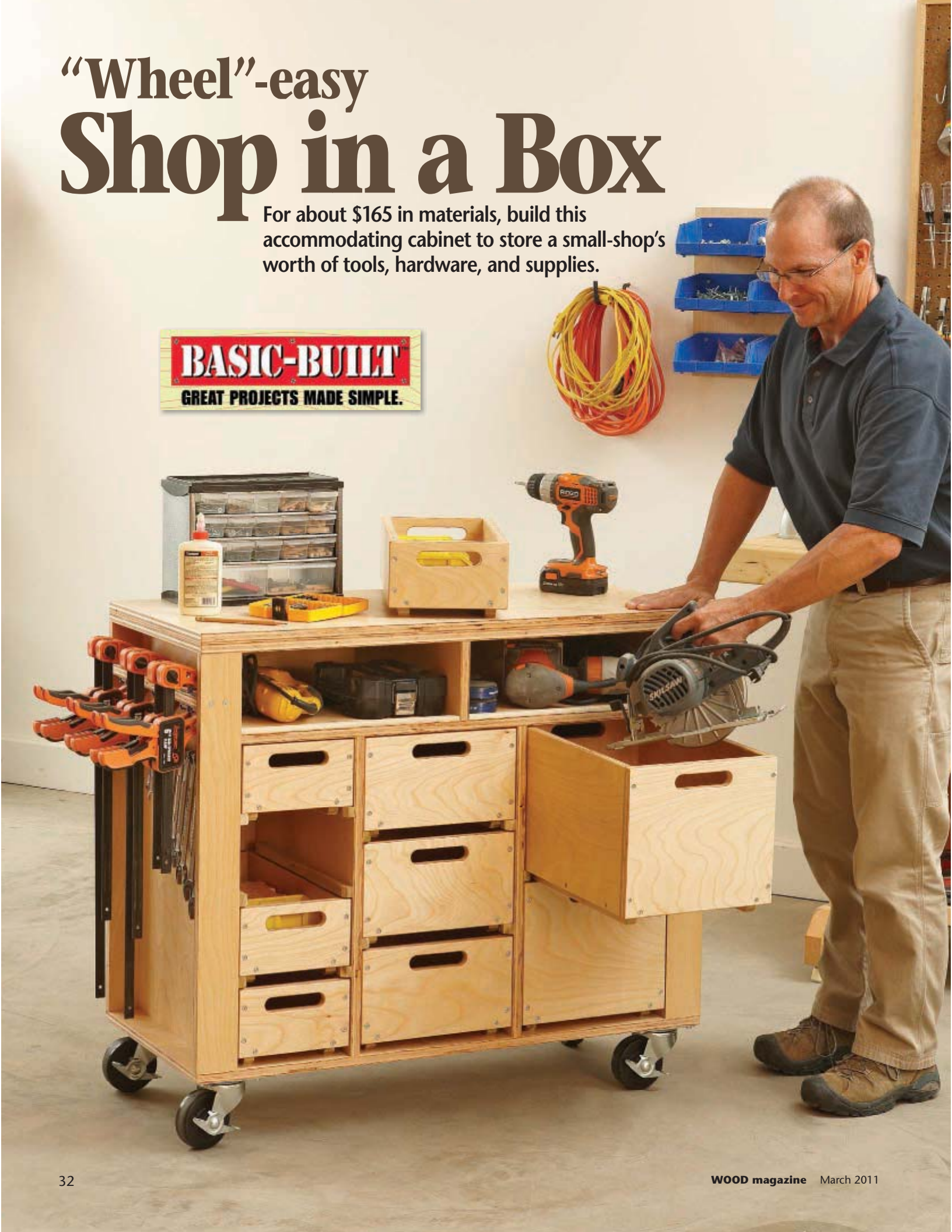
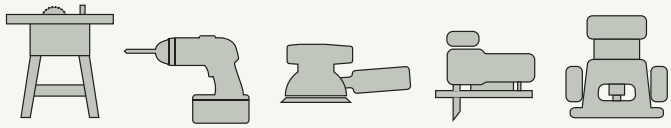


WHAT YOU'LL NEED



- Materials: Two and one-half sheets of ¾" plywood, one-half sheet of ¼" plywood, one 1×6×120" pine or poplar board, four casters and screws (see details on *page 37*).

PROJECT HIGHLIGHTS

- Overall dimensions: 40" long × 18" deep × 36" high.
- Learn how to size parts correctly when working with undersize plywood thicknesses.
- Simple joinery—mostly glue-and-screw assembly.
- When removed from the cabinet, drawers nest together for safe portage.

COST

- We paid $165 for everything and purchased high-quality, void-free plywood. You could save by using a lesser-grade plywood.

Got tools and "stuff" all over your workshop or garage? Round it all up, get it organized, and make it mobile with this simple-to-build project. Each of the bins has two handles and slides out completely so you can take one or more to a job location. Or, remove all of them to lighten the cart for easy carrying upstairs or loading into your vehicle.

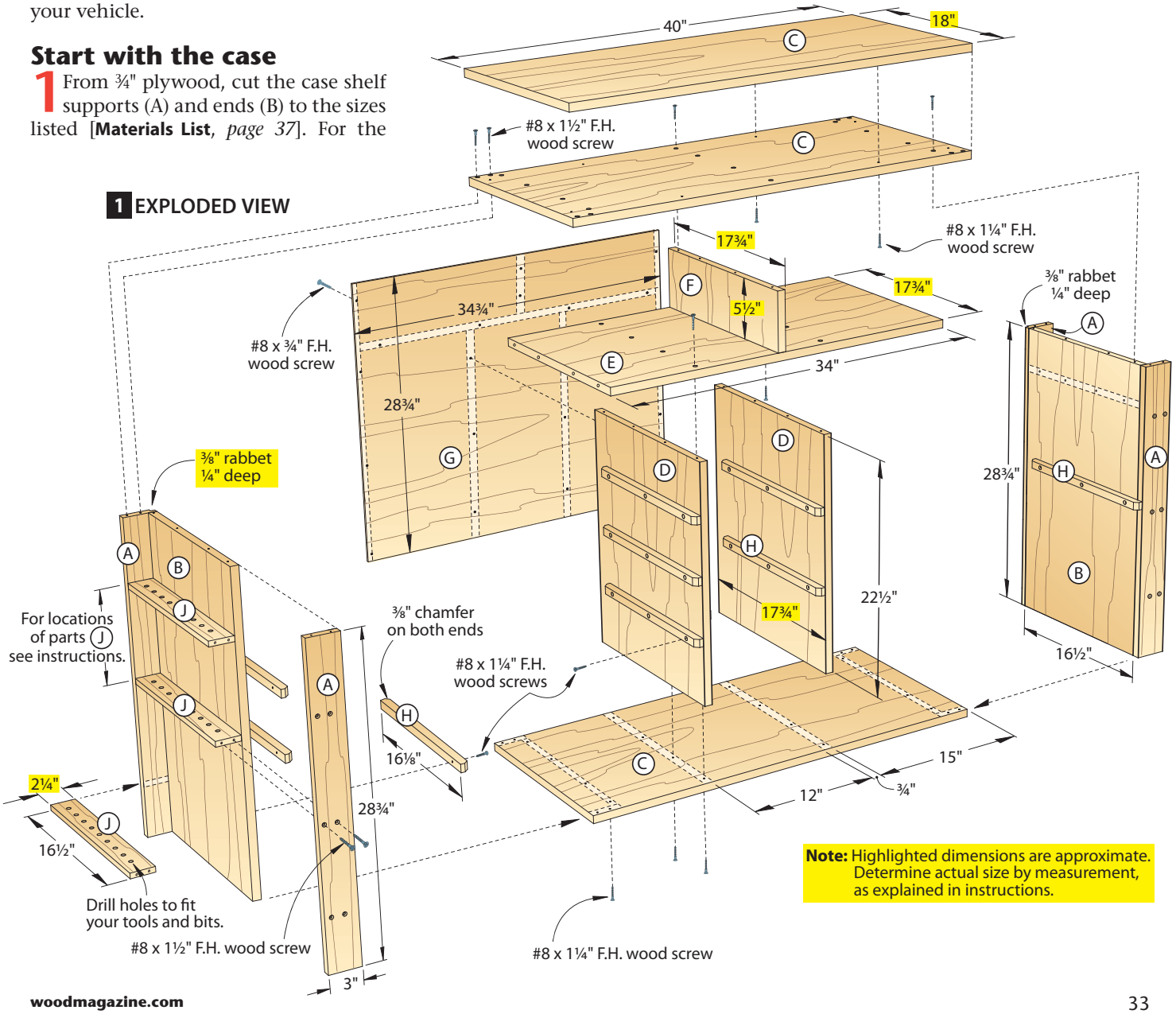
Start with the case

1 From ¾" plywood, cut the case shelf supports (A) and ends (B) to the sizes listed [**Materials List**, *page 37*]. For the best appearance and void-free surfaces and edges, we used birch plywood from a home center.

2 Using a ⅜" rabbeting bit in your handheld router, rout a ⅜" rabbet ¼" deep along the back inside edge of two shelf supports (A) to receive the plywood back (G) [**Drawing 1**]. Glue and clamp the supports to the ends (B), positioning the rabbets where shown.

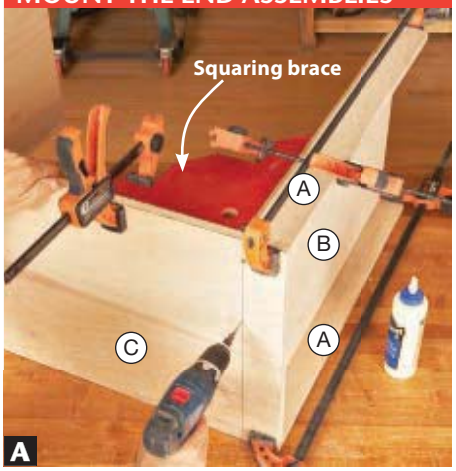
3 Refer to the **Shop Tip** on *page 34*. Then, determine the exact width for the two tops and the bottom (C) by measuring the width of a shelf support/end assembly (A/B). (Ours measured approximately 17 15⁄16".) Rip the tops and bottom

1 EXPLODED VIEW



Note: Highlighted dimensions are approximate. Determine actual size by measurement, as explained in instructions.

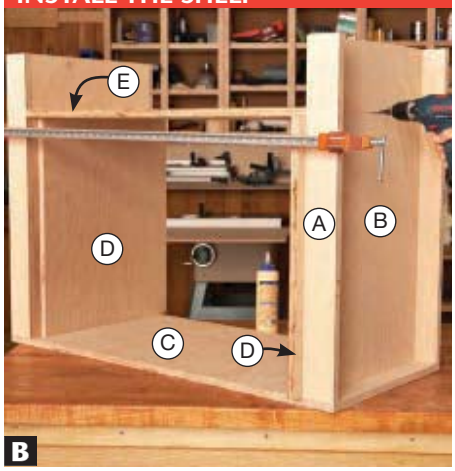
MOUNT THE END ASSEMBLIES



A

Glue, screw, and clamp the end assemblies (A/B) to the bottom (C). Use a squaring brace to keep the assemblies 90° to the bottom.

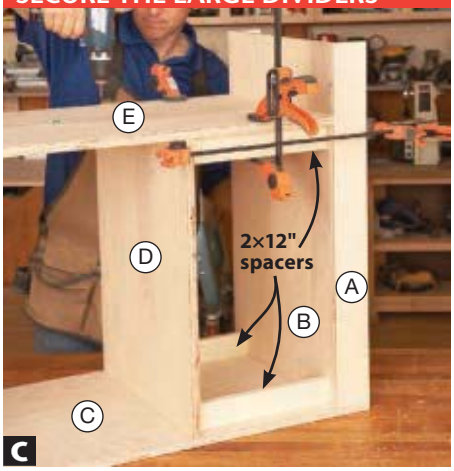
INSTALL THE SHELF



B

Using the large dividers (D) as spacers to position the shelf (E), drive screws through the case ends (B) and into the shelf.

SECURE THE LARGE DIVIDERS



C

Use 2×12" spacers to align the large dividers (D) in the case. Drive screws through the bottom (C) and shelf (E) into the dividers.

to your measured width and crosscut to a length of 40". Now attach the end assemblies to the bottom [**Photo A**, **Drawing 1**]. ***Quick Tip!*** Drill countersunk shank and pilot holes for the #8 screws in this project. This will prevent splitting the plywood and ensure a smooth surface.

4 To determine the precise width for the large dividers (D), measure from the front face of a front shelf support (A) to the rabbet on the back shelf support. Rip the dividers' width to your measurement and crosscut to a length of 22½". Next, rip the width of the shelf (E) to the same width as the dividers and crosscut to a length of 34". (It's a good idea to measure between the case ends to verify the length for the shelf.) Now, install the shelf [**Photo B**].

5 From ¾" scrap, cut four 2×12" spacers to position the large dividers (D) in the case where dimensioned [**Drawing 1**]. Screw a divider in place [**Photo C**]. Use the spacers again to secure the remaining divider. ***Quick Tip!*** Be sure to use spacers. The spacers ensure correct alignment of the dividers so the drawers will slide freely in the case.

6 Measure for the length of the small divider (F) [**Photo D**]. Crosscut the divider's length to your measurement and the same width as the large dividers (D). Center the divider on the shelf (E) end to end, and screw it in place through the bottom of the shelf.

7 Position the lower top (C) on the case. Drill mounting holes and drive screws through it, centered into the ends of the end assemblies (A/B) and small divider (F). Then, align the upper top (C) on the lower top and screw it in place. You'll need to angle your drill slightly when drilling the holes and driving the screws along the front and back edges. ***Quick Tip!*** Do not glue the upper top to the lower top. By omitting glue, you can replace the top should it become too worn. Also, by securing the top from the lower top, you'll have a smooth, fastener-free work surface.

8 From ¼" birch plywood, cut the back (G) to fit the rabbeted opening. Although the dimensions should be exact, it's a good idea to measure the opening to make sure. Set the back aside.

Next up: Guides, stops, and shelves

1 To form 30 drawer guides (H), crosscut five 16⅛"-long blanks from a 1×6×120" nominal (¾×5½×120" actual) pine or poplar board. Save the remainder for use later. Using a 45° chamfer bit in your router, rout a ⅜" chamfer across both ends of each blank. Now, using your tablesaw, rip ¾"-wide guides from each blank [**Photo E**]. You'll mount 12 of the guides inside the case [**Drawing 1**]. Set aside the remaining guides for installation on the drawer bottoms. These guides allow the drawers to interlock when stacked so that you can safely carry them about when needed.

2 From ¼" scrap, cut 5⅝×10", 7½×10", and 11¼×10" spacers for positioning the drawer guides (H) in the case where dimensioned [**Drawing 2**]. ***Quick Tip!*** Cut the spacers precisely. This will ensure that the drawers will fit correctly when cut to the listed sizes later. Using the

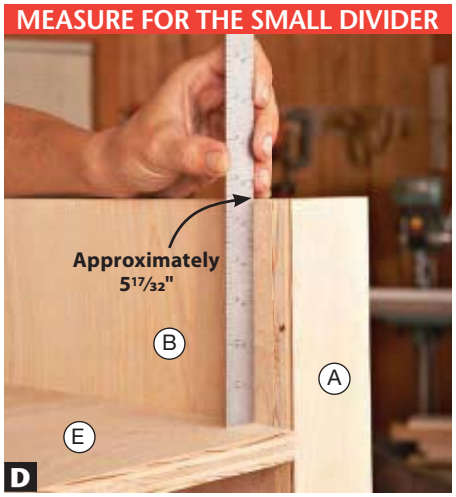
SHOP TIP

The skinny on working with undersize plywood

Ever cut plywood parts to the specified sizes and found that some parts didn't fit together correctly? That's because the thickness of nearly all plywood measures slightly less than stated, so you may need to tweak the dimensions of some parts to fit properly. Follow these guidelines for identifying the affected parts and avoiding problems.

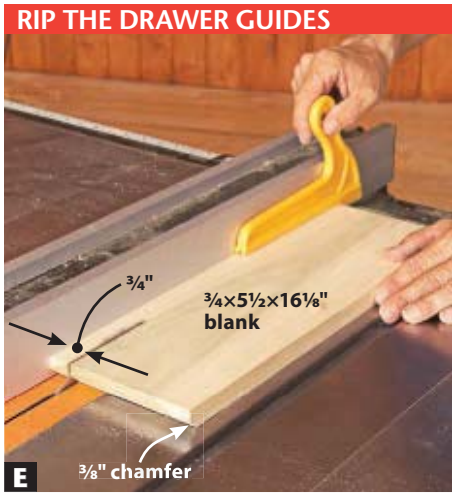
- Never precut all of a project's plywood parts to the specified sizes because some of the sizes may be approximate.
- Look over the project drawings beforehand and identify the parts that need measurement to fit correctly. Parts that install between other parts, such as shelves, dividers, and drawers, and parts that match the width or length of subassemblies are prime targets. Circle or highlight the applicable dimensions, as we did on the drawings and the Materials List, as a reminder to measure for the exact size during assembly.
- Cut only the parts that have both exact width and length dimensions first. Assemble these parts (dry-assembly is fine), and measure for the custom-fit parts.

MEASURE FOR THE SMALL DIVIDER



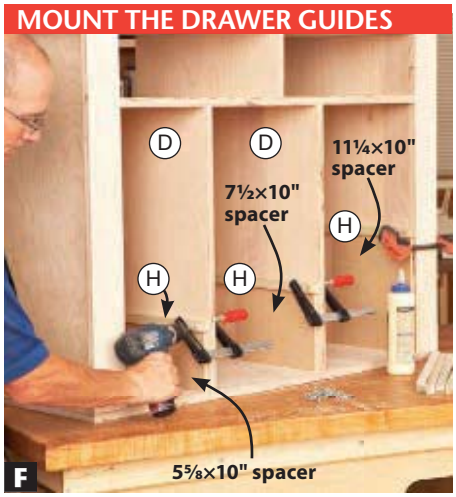
Measure from the top of the case end (B) to the shelf (E) to find the actual width of the small divider (F).

RIP THE DRAWER GUIDES



With your tablesaw fence positioned ¾" from the inside of the blade, rip six drawer guides (H) from each of the five ¾×5½×16⅛" blanks.

MOUNT THE DRAWER GUIDES



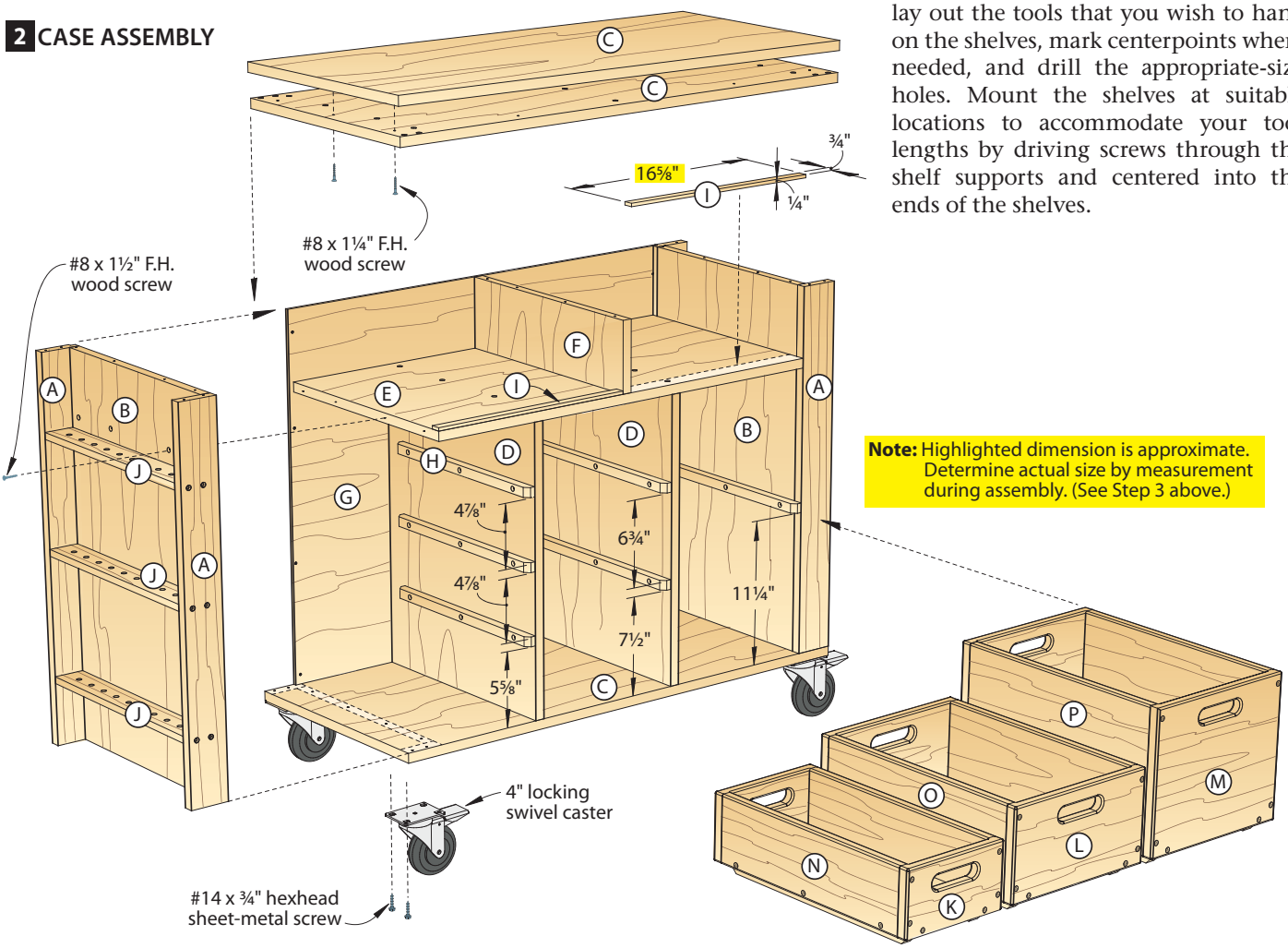
Position the drawer guides (H) on spacers, flush with the front of the case. Glue and screw the guides to the case.

appropriate spacer, glue and screw the guides in the case opening for the large drawer, and only the bottom pair of guides in the openings for the small- and medium-size drawers [**Photo F**]. Next, trim the 5⅝"-tall spacer to 4⅞" and the 7½"-tall spacer to 6¾". Now install the remaining guides in the small and medium openings where shown.

3 Measure the openings between the case ends (B) and small divider (F). From your leftover 1×6, rip two ¼"-wide strips for the shelf stops (I) [**Drawing 2**]. Crosscut the strips to length to fit your openings. Glue the stops in place, flush with the case front.

4 To determine the width for the end shelves (J), measure from the outside edge of a shelf support (A) to the case end (B). Then rip six shelves to the measured width and crosscut them to 16½" in length. Before mounting the shelves, lay out the tools that you wish to hang on the shelves, mark centerpoints where needed, and drill the appropriate-size holes. Mount the shelves at suitable locations to accommodate your tool lengths by driving screws through the shelf supports and centered into the ends of the shelves.

2 CASE ASSEMBLY



Note: Highlighted dimension is approximate. Determine actual size by measurement during assembly. (See Step 3 above.)

Fabricate the drawers

1 From ¾" plywood, rip the small, medium, and large drawer fronts/backs (K, L, M) to the listed widths. Next, crosscut the medium and large fronts/backs (L, M) to the listed length of 11⅞". Now crosscut the small fronts/backs (K) to a length ⅛" less than the measured opening. (Our small fronts/backs were approximately 1/16" longer than the listed approximate length of 8⅜".)

2 To form the centered grip openings in the fronts/backs (K, L, M), mark centerpoints for 1" holes at the ends of the openings where dimensioned [**Drawing 3**]. Bore the holes using a spade or Forstner bit in your drill and a backer board to prevent tear-out. If you have a drill press, it's ideal to use it with a fence and stopblock for this. Draw tangent lines to connect the holes. Now complete the openings [**Photo G**].

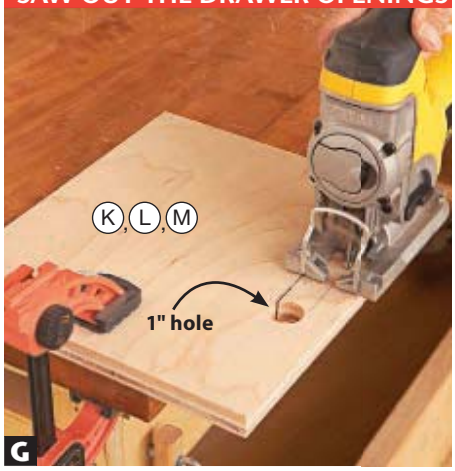
3 Smooth the openings in the fronts/backs using a flat file and a piece of ¾"-diameter dowel wrapped with 100- or 120-grit sandpaper. Rechuck your router with a ⅛" round-over bit. Now rout along the edges of the openings on both sides of the fronts/backs [**Drawing 3**].

4 From ¾" plywood, cut the small, medium, and large drawer sides (N, O, P) to the sizes listed. (The widths must match the fronts/backs.)

5 To determine the widths for the small bottoms (Q) and the medium/large bottoms (R) for the drawers, hold two small scrap pieces of your ¾" plywood tightly together and measure the combined thickness. Then, subtract this measurement from the length of the corresponding drawer fronts/backs—part K for the small drawers and parts L and M for the medium and large drawers. (Your drawer-bottom widths will be slightly greater than the listed approximate dimensions.) Now, rip the bottoms to the appropriate widths and crosscut them to the listed length of 16¼".

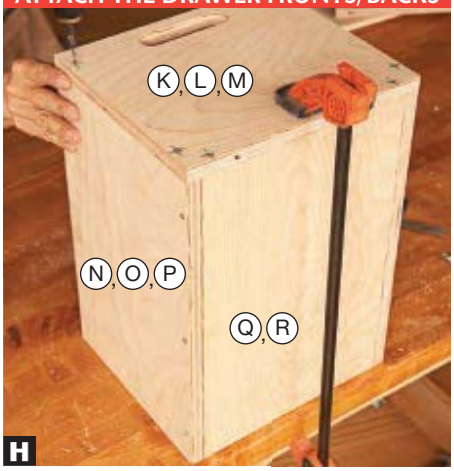
6 Sand all of the drawer parts to 180 grit. Then, keeping the ends of the parts aligned, glue and screw the corresponding sides to the bottoms: small drawer parts N to Q, medium drawer parts O to R, and large drawer parts P to R.

SAW OUT THE DRAWER OPENINGS



Using your jigsaw, cut along the inside of the lines on the fronts/backs (K, L, M) to remove the waste and complete the openings.

ATTACH THE DRAWER FRONTS/BACKS



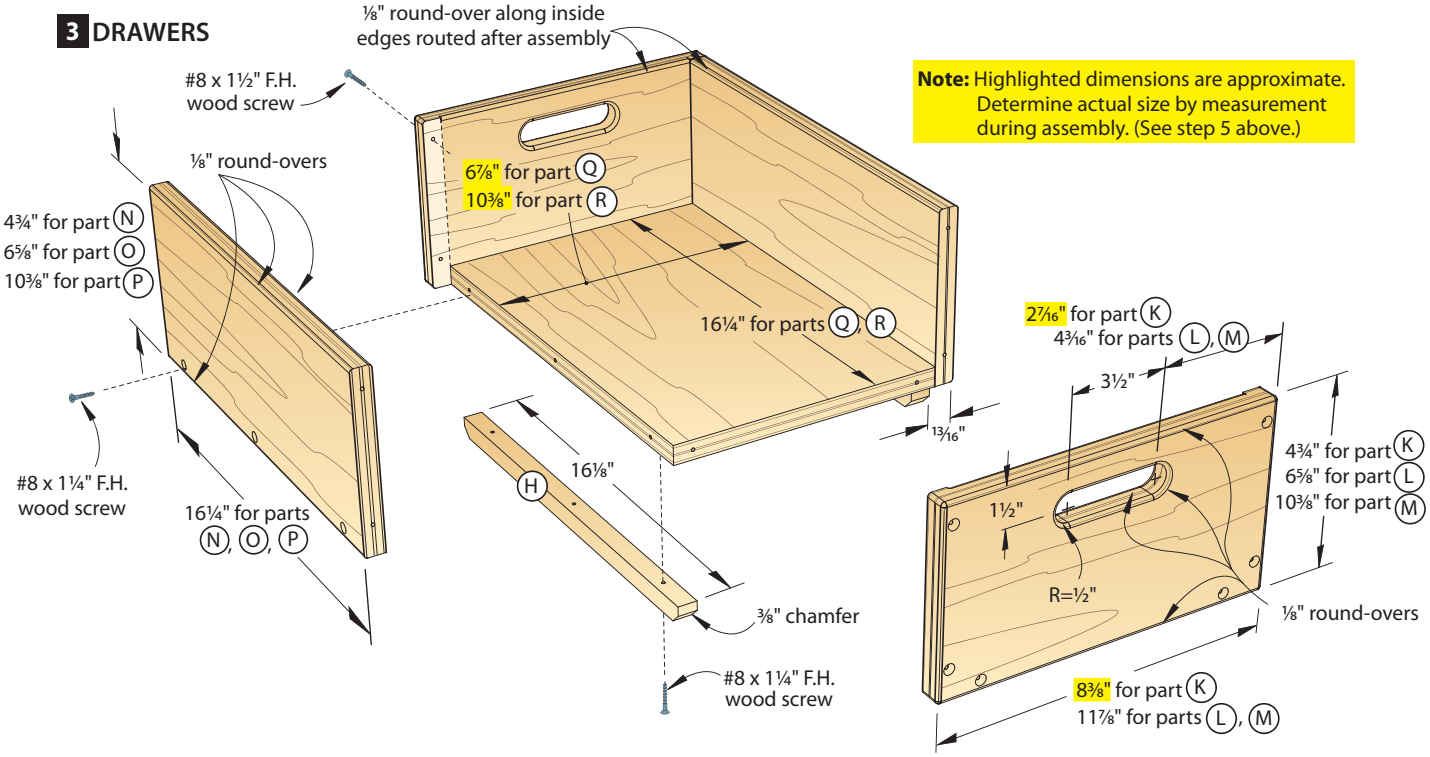
Clamp a drawer front to the side/bottom assembly, drill pilot holes, and drive screws. Repeat the process to add the back.

Quick Tip! Let the glue dry before driving the screws. This will prevent parts from slipping when screwing them together.

7 Mark centerpoints on the drawer fronts/backs (K, L, M) for the screws, where shown [**Drawing 3**]. Glue and screw the fronts/backs to the corresponding side/bottom assemblies (N/Q, O/R, P/R) [**Photo H**]. Drive the screws at the bottom first. Then, if needed, slightly flex the sides to align them with the ends of the fronts and backs, and drive the screws at the ends.

8 Glue and screw a pair of the remaining drawer guides (H) to the bottoms of the small, medium, and large drawers.

3 DRAWERS


⅛" round-over along inside edges routed after assembly
#8 x 1½" F.H. wood screw
⅛" round-overs
4¾" for part N
6⅝" for part O
10⅜" for part P
#8 x 1¼" F.H. wood screw
16¼" for parts N, O, P
6⅞" for part Q
10⅜" for part R
16¼" for parts Q, R
H
16⅛"
⅜" chamfer
#8 x 1¼" F.H. wood screw
Note: Highlighted dimensions are approximate. Determine actual size by measurement during assembly. (See step 5 above.)
2⁷⁄₁₆" for part K
4³⁄₁₆" for parts L, M
3½"
1³⁄₁₆"
1½"
R=½"
4¾" for part K
6⅝" for part L
10⅜" for part M
⅛" round-overs
8⅜" for part K
11⅞" for parts L, M

Position the guides 13⁄16" from the outside face of the sides (N, O, P) and 13⁄16" back from the outside face of the fronts (K, L, M), where dimensioned [**Drawing 3**]. This will allow the guides to fit inside the other drawers when stacked.

9 Rout 1⁄8" round-overs along the inside and outside edges of the drawers, where shown.

A few final details

1 Finish-sand the cart, drawers, and back (G) to 180 grit, and remove the dust. Drill pilot holes and screw the back to the cart where shown [**Drawing 1**]. Apply a finish if you wish. We applied boiled linseed oil, which we easily can reapply whenever needed.

2 Finally, screw-mount 4" locking swivel casters to the case bottom (C) [**Drawing 2**]. Align the caster mounting plates 1⁄8" from the ends and edges of the bottom. Now round up your tools, load up the cart, and slide in the drawers. Congrats—you're ready to roll fully organized to your next project!

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Produced by **Owen Duvall** with **Jeff Mertz**
Project design: **Jeff Mertz**
Illustrations: **Roxanne LeMoine**; **Lorna Johnson**

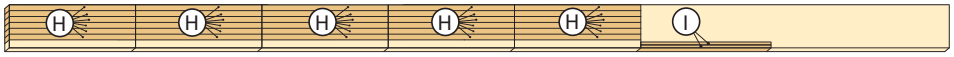
Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
Case						
A	shelf supports	¾"	3"	28¾"	BP	4
B	ends	¾"	16½"	28¾"	BP	2
C	tops/bottom	¾"	18"	40"	BP	3
D	large dividers	¾"	17¾"	22½"	BP	2
E	shelf	¾"	17¾"	34"	BP	1
F	small divider	¾"	17¾"	5½"	BP	1
G	back	¼"	28¾"	34¾"	BP	1
H*	drawer guides	¾"	¾"	16⅛"	P	30
I*	shelf stops	¼"	¾"	16⅝"	P	2
J	end shelves	¾"	2¼"	16½"	BP	6
Drawers						
K	small fronts/backs	¾"	4¾"	8⅜"	BP	8
L	medium fronts/backs	¾"	6⅝"	11⅞"	BP	6
M	large fronts/backs	¾"	10⅜"	11⅞"	BP	4
N	small sides	¾"	4¾"	16¼"	BP	8
O	medium sides	¾"	6⅝"	16¼"	BP	6
P	large sides	¾"	10⅜"	16¼"	BP	4
Q	small bottoms	¾"	6⅞"	16¼"	BP	4
R	medium/large bottoms	¾"	10⅜"	16¼"	BP	5

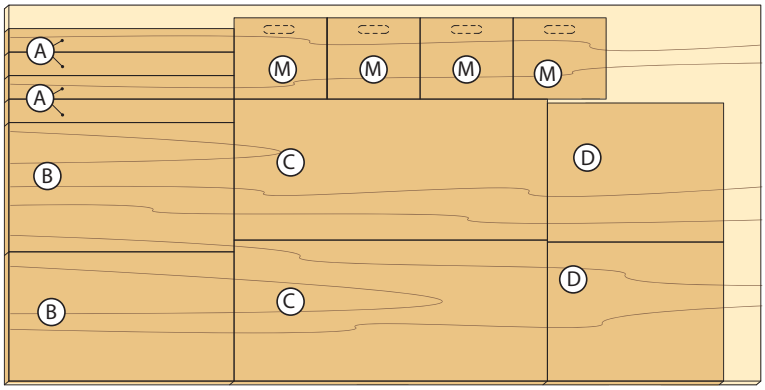
*Parts initially cut oversize. See the instructions.
Highlighted dimensions are approximate. See the instructions.

Materials key: BP–birch plywood, P–pine or poplar.
Supplies: #8×1¼" and #8×1½" flathead wood screws; #14×¾" hexhead sheet-metal screws (16); 4" locking swivel casters (4).
Bits: ⅛" round-over, 45° chamfer, and ⅜" rabbeting router bits; 1" spade or Forstner bit.

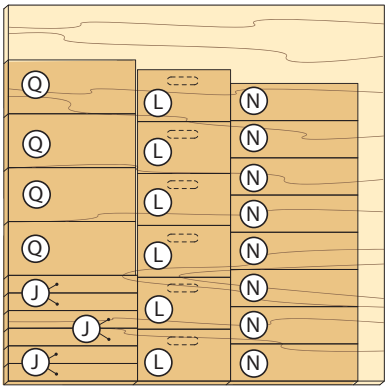
Cutting Diagram



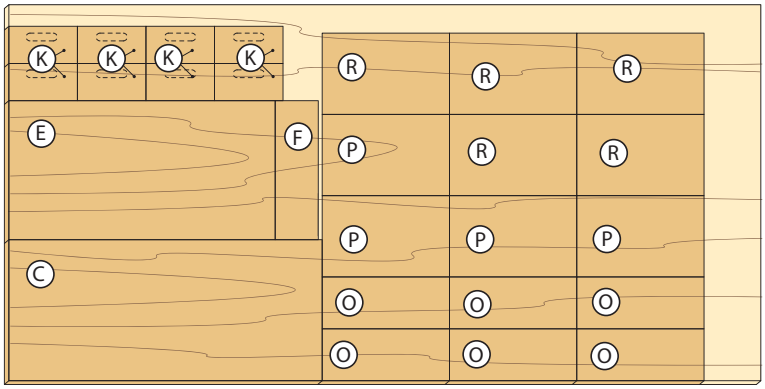
¾ x 5½ x 120" Pine or poplar (1x6x10')



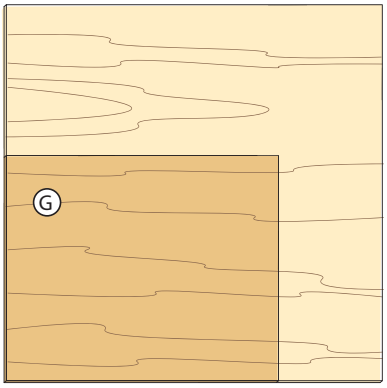
¾ x 48 x 96" Birch plywood



¾ x 48 x 48" Birch plywood



¾ x 48 x 96" Birch plywood



¼ x 48 x 48" Birch plywood

Corner Curio

Glass, mirrors, and cherry wood give this angled cabinet class.

Though it may appear to be one cabinet, this collectible showcase is actually two identical, stacked units. So once you set up to cut the pieces for the bottom unit, simply cut a second set of identical pieces for the top unit. As shown at *left*, mirrors in the backs and bottoms, and glass shelves and doors add an extra display dimension for showing off treasured pieces. Or for a warmer appearance, swap the mirrors for stained plywood panels, as shown *below*.

Start with the cases

1 From ¾" plywood (birch if you're adding the mirrors; cherry if not), cut the backs (A) and wide backs (B) with a 45° bevel on one edge of each piece [**Drawing 1**, **Materials List**, *page 44*].

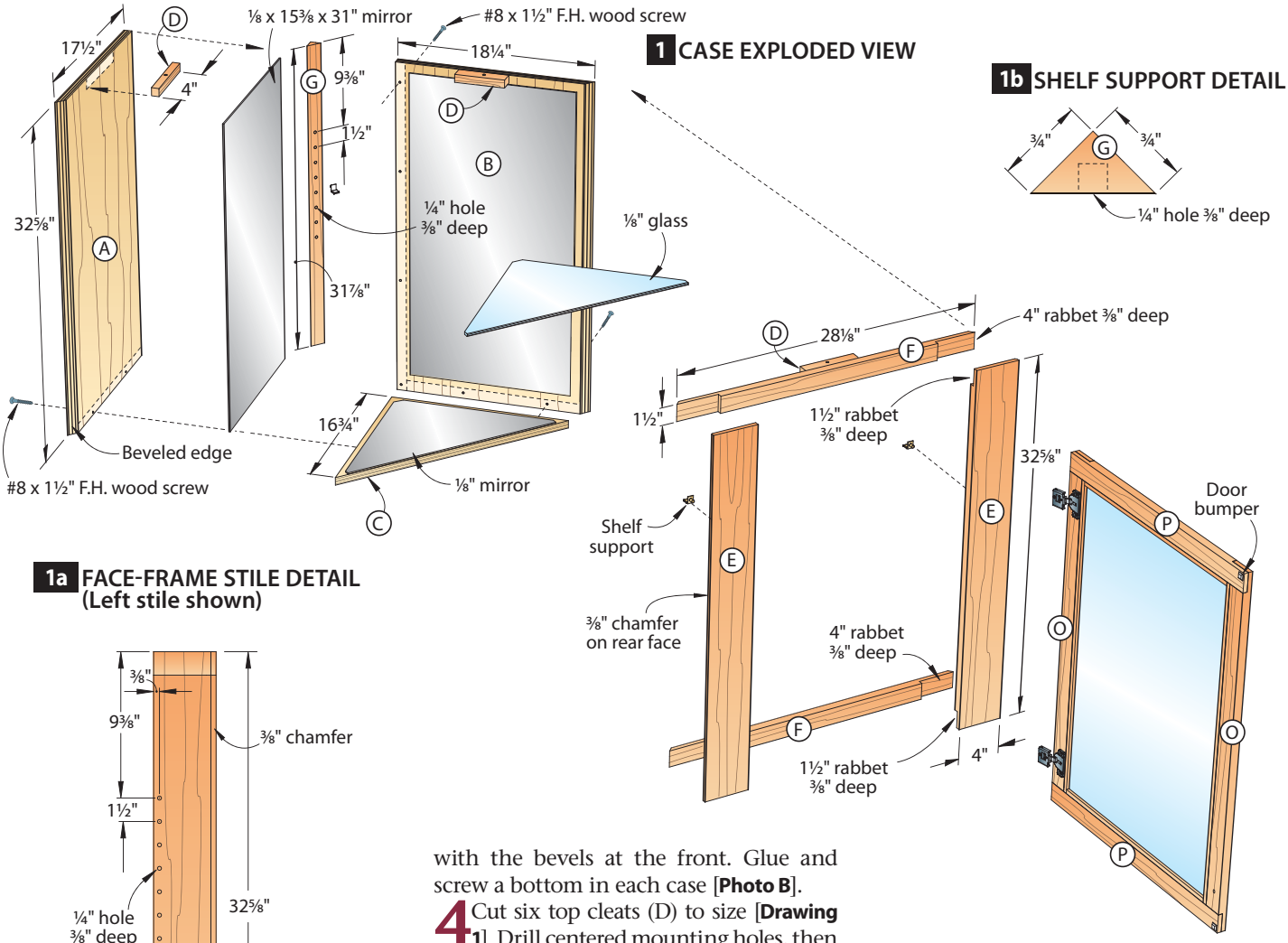
2 Make six bevel-clamping blocks [**Shop Tip,** *opposite*]. With help from a squaring brace, glue a back (A) to a wide back (B) [**Photo A**]. (See **More Resources** on *page 44* for free plans for a squaring brace.) Drill pilot holes, then screw the wide back to the back [**Drawing 1**]. Repeat for the second case.

3 Cut a 17"-square blank from ¾" birch plywood for the bottoms (C). Draw a diagonal line across the blank from corner to corner. Jigsaw or bandsaw along the line and sand the cut edges with a belt sander, checking the fit in the case (A/B). The front edge should be flush

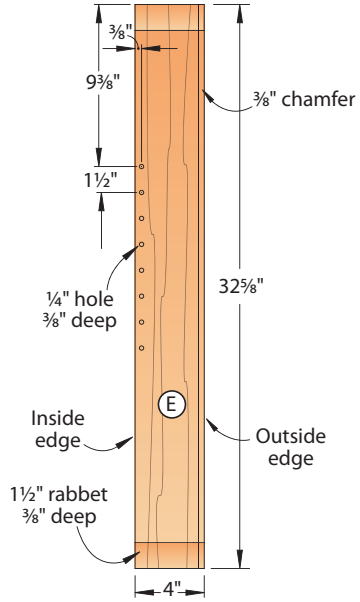
Option with cherry plywood panels in place of the mirrors

PROJECT HIGHLIGHTS

- Overall dimensions: 21 5/16" wide along each side x 72½" high.
- Built from solid cherry and poplar, and birch plywood.
- Pocket lights and glass shelves brighten the inside of the cabinets.
- Cost of materials: $420 with mirrors, $380 with plywood panels.



1a FACE-FRAME STILE DETAIL (Left stile shown)

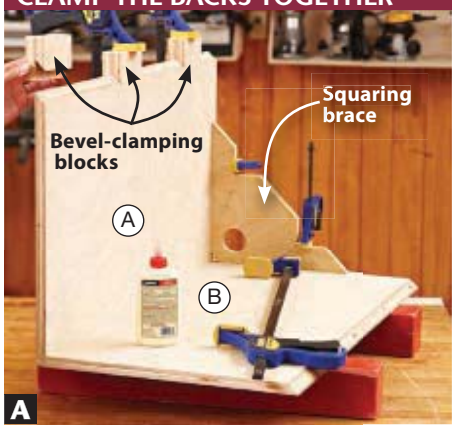


with the bevels at the front. Glue and screw a bottom in each case [**Photo B**].

4 Cut six top cleats (D) to size [**Drawing 1**]. Drill centered mounting holes, then set these aside for attaching the top later.

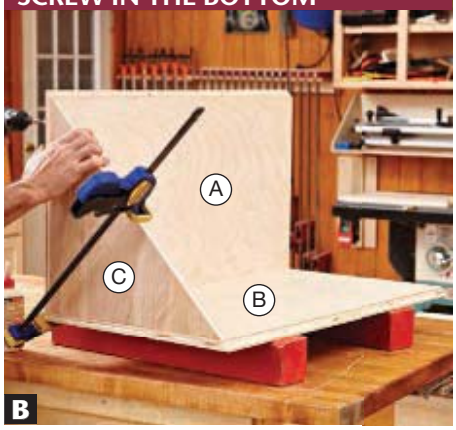
5 Cut the face-frame stiles (E) and rails (F) to size [**Drawing 1**]. Mount a dado set in your tablesaw and cut ⅜"-deep rabbets on the ends of each stile and rail to form lap joints [**Drawing 1**]. (See **More Resources** on *page 44* for more information on cutting lap joints.) Lay out and drill a row of ¼" shelf-pin holes on the

CLAMP THE BACKS TOGETHER



Simplify assembly of the backs (A, B) by using bevel-clamping blocks (Shop Tip, *right*) and a squaring brace.

SCREW IN THE BOTTOM

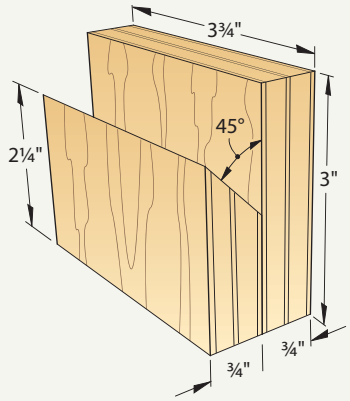


After cutting the bottom (C) to fit, clamp it flush with the bottom edges of the back (A, B) pieces, then glue and screw it in place.

SHOP TIP

Simple block helps you clamp odd angles

Clamping directly on the beveled edges of the backs (A,B) can crumple those sharp edges. The bevel-clamping block, shown *below*, protects the angled edge while keeping clamping pressure parallel to the back. Make six bevel-clamping blocks for assembling this project.



back side of each stile, making sure you end up with mirrored pairs of stiles [**Drawings 1** and **1a**].

6 Apply glue to the joints and clamp the face frame, checking that each joint is tight and square [**Photo C**]. Repeat this process to assemble the face frame for the other case.

7 After the glue dries on the face frames (E/F), rout a ⅜" 45° chamfer on the back outside edge of each stile (E) [**Drawing 1a**]. Sand the back side of the face frames to 220 grit.

8 Screw temporary clamping blocks to the back of the case (A–C) [**Photo D**]. Apply glue to the beveled front edges of the case, and center the face frame (E/F) side-to-side and flush at the top and bottom of the case. Clamp it in position and let the glue dry. Repeat this process for the second case.

9 Rip a ¾×2½×31⅞" blank for the shelf supports (G). Rip two shelf supports from the blank [**Photos E, F**]. Lay out the shelf-pin holes on the shelf supports [**Drawing 1**] and drill them ⅜" deep [**Shop Tip**, *below*]. Glue the shelf supports (G) in the back of the cases [**Drawing 1**].

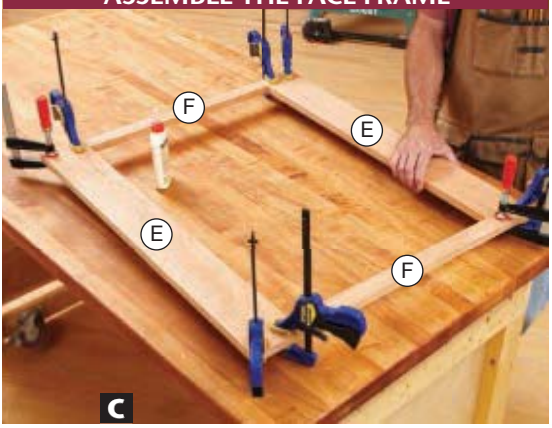
Build a base for under the case

1 Cut the front trim (H) and the back rails (I) to size with 45° miters on the ends of each piece [**Drawing 2**]. ***Quick Tip! Save money on hidden parts.*** Because the back rails won't be seen, you can use a less expensive wood such as poplar. Rout a ⅜" chamfer along the top front edge of the front trim.

2 Dry-assemble the front trim (H) and two back rails (I) and mark locations for #20 biscuit slots centered on each joint. Cut the slots, then glue each joint [**Photo G**]. Repeat for the other front trim and back rails.

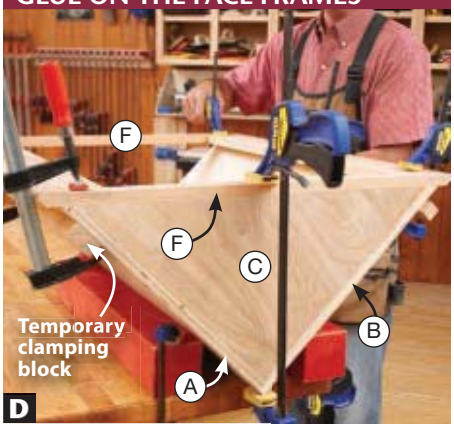
3 Cut a ¾×4½×11" blank for the feet (J). Bevel-rip one edge to create a ⅝" chamfer, then rip the blank to a final width of 4". Cut each foot from the blank to a final length of 5" [**Drawing 2**].

ASSEMBLE THE FACE FRAME



When gluing the wide half-lap joints on the face frame (E/F) use two clamps on each joint, one near the inside and one near the outside.

GLUE ON THE FACE FRAMES



Support a case (A–C) between a couple of blocks on your bench. Then glue the face frames (E/F) to the front of the case.

TRIM OFF A SHELF SUPPORT

Tilt your tablesaw blade to 45° and bevel-rip a shelf support (G) from one edge of an oversize blank.

RIP OFF ANOTHER

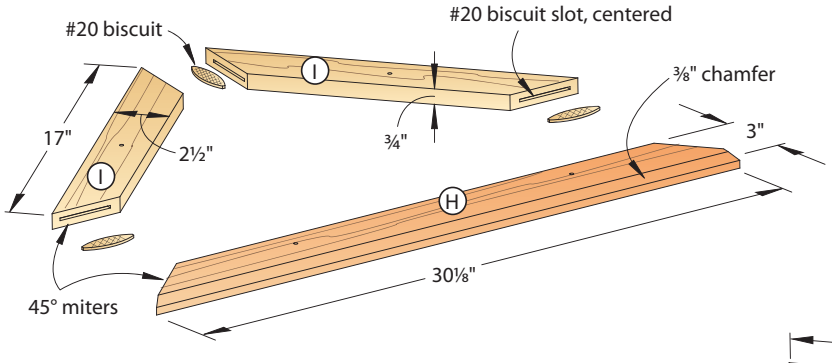
Cut a shelf support (G) for the other case from the same blank by setting the blade back to 90° and ripping the piece to size.

SHOP TIP

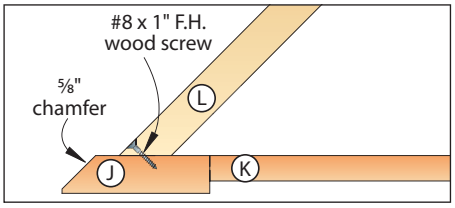
"V" is for victory over hard-to-drill parts

To support the angled shelf supports (G) when drilling, make a 90° V-groove in a 1½"-thick scrap of solid wood. To do this, make intersecting 45° bevel rips on one face of the scrap.

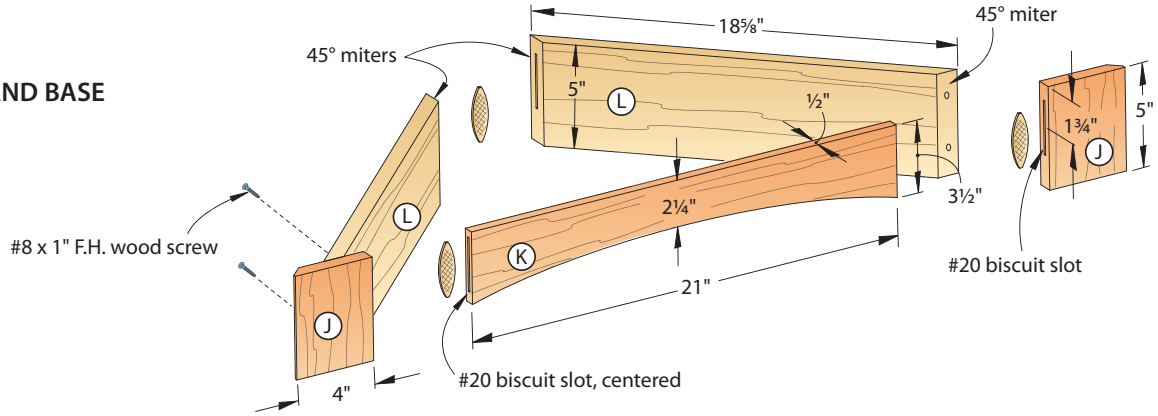
Center the bottom of the V on your drill-press table under the bit, slide the fence up to the block and lock the fence. The V-block cradles the shelf support for rock-solid drilling.



2a BASE TOP SECTION VIEW DETAIL



2 TRIM AND BASE



4 Cut the front rail (K) to size [**Drawing 2**] and use a fairing stick to lay out the arc on the bottom edge. (See **More Resources** for more information about making and using a fairing stick.) Then cut and sand the arc to the line. Lay out and cut biscuit slots on the front rail (K) and feet (J) where shown and glue the feet to the front rail [**Photo H**].

5 Cut the back cleats (L) to size [**Drawing 2**] and cut biscuit slots in the back corner. Glue the cleats together [**Photo I**].

6 Apply glue to the front end of each cleat (L). Then center it on the back of the base-front assembly (J/K) and clamp it in place with a band clamp. Drive 1" screws through the cleats to secure the joints [**Drawing 2a**, **Photo J**].

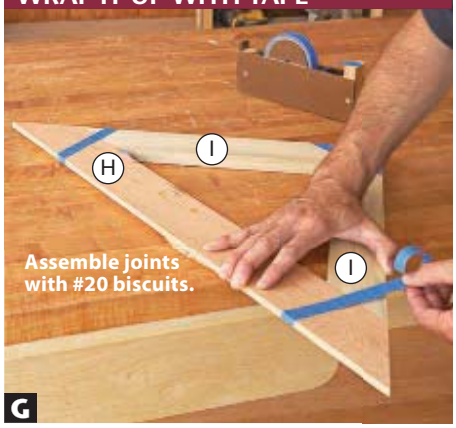
7 To complete the base, glue one of the frame assemblies (H/I) centered on top of the base frame (J/K/L) [**Drawings 2, 4**]. Set the other frame assembly aside.

Start the subassembly

1 Turn the lower case (A–F) upside down and center the base (H–L) on it. ***Note:*** *The miters on the ends of the front trim (H) and the chamfers on the face-frame stiles (E) should be flush.* Drill pilot holes through the front trim and back rails (I) [**Drawings 2, 4**] and screw the frame in place. Retrieve the other frame (H/I) and screw it to the bottom of the upper case.

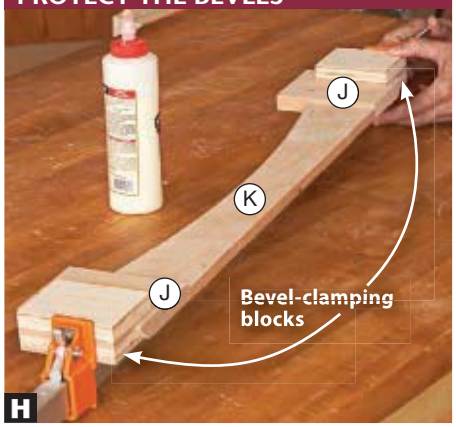
2 Edge-glue a ¾"-thick blank for the top (M). After the glue dries, cut the

WRAP IT UP WITH TAPE



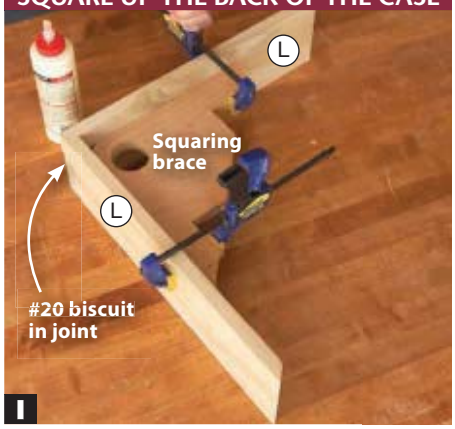
Using painter's tape, clamp the mitered ends of the front trim (H) flush with the edges of the back rails (I).

PROTECT THE BEVELS



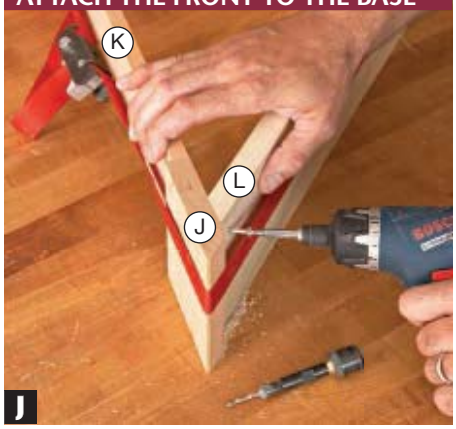
Glue the feet (J) to the front rail (K), using the bevel-clamping blocks to protect the sharp points on the bevels from damage.

SQUARE UP THE BACK OF THE CASE



Join the two back cleats (L) with a biscuit joint and hold them square with a squaring brace while the glue dries.

ATTACH THE FRONT TO THE BASE



Clamp the base-front assembly (J/K) onto the back cleats (L) with a band clamp while driving in screws.

SHOP TIP

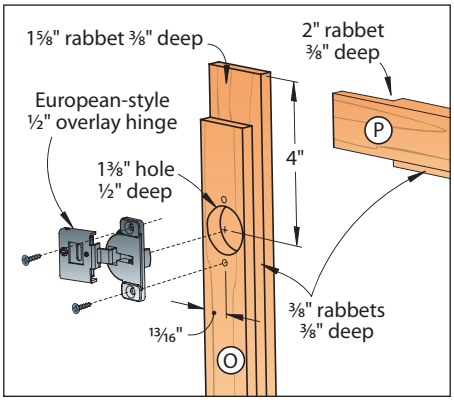
Perfect pressure for persnickety parts

How do you securely clamp a fragile part, such as the mirrors in this project, without risking part breakage? We placed ¾"-thick cauls against the mirror being glued, then bent some ¼"-thick flexible strips of scrapwood to hold the cauls in position while the adhesive dried. Fit one end of each strip into a corner, and bow the strip to put slight clamping pressure on the caul. If the strips slip, cut shallow saw kerfs in the caul to trap the end.

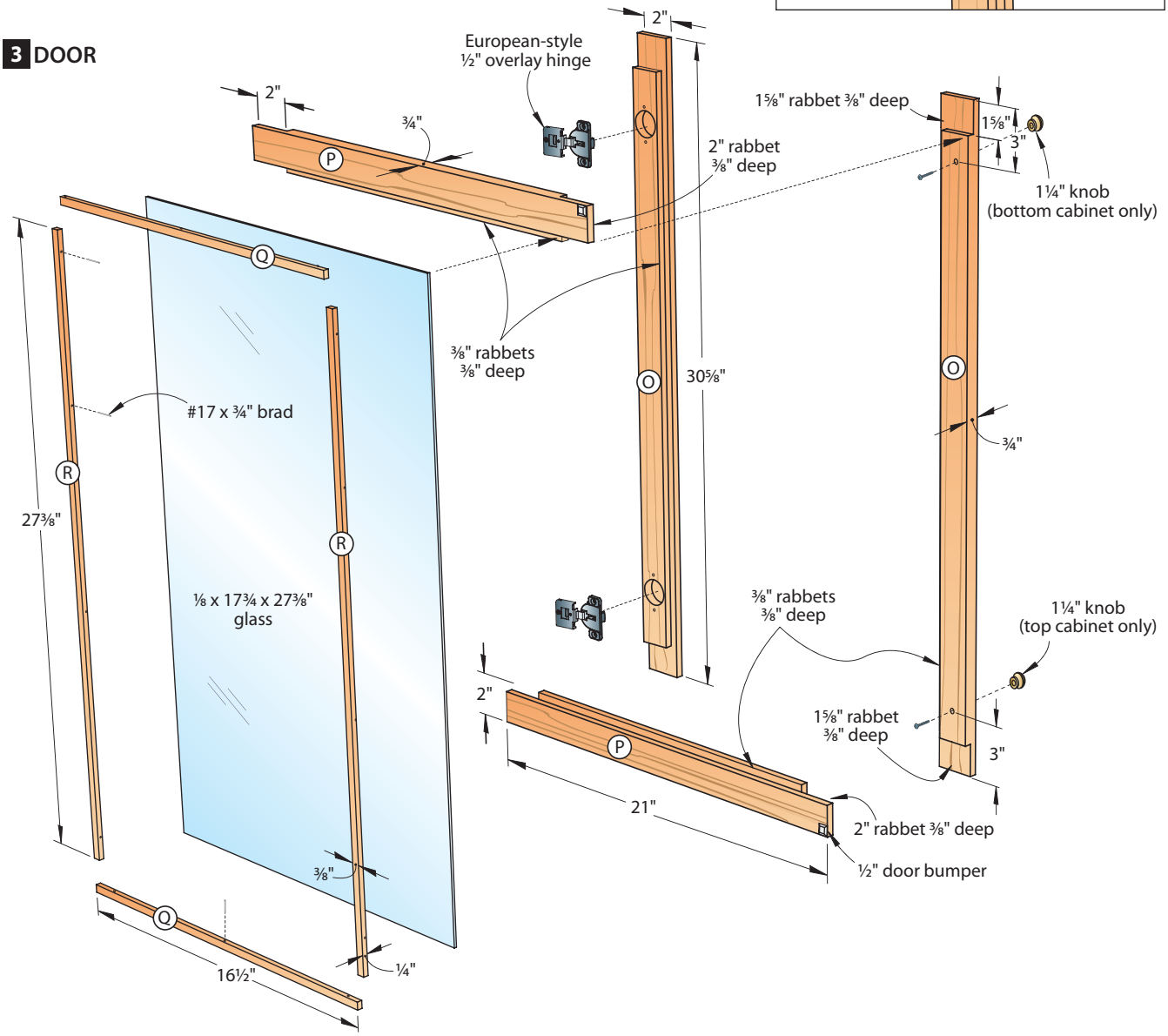
blank to size [**Drawing 4**] and rout a ⅜" chamfer along the front bottom edge.

3 Cut a ½×2×27½" blank for the cove trim (N). Rout a ⅜" cove on the edges and ends, then finish-sand the blank. Rip a ½"-wide piece of cove trim from each edge of the blank.

3a DOOR DETAIL



3 DOOR



4 Glue and clamp the cove trim (N) flush with the tops of the face-frame rails (F) [**Photo K**].

Build the doors

1 Cut the door stiles (O) and rails (P) to size [**Drawing 3**]. Mount a dado blade in your tablesaw, raise it ⅜" above the table, and cut the half-lap joints. ***Note:*** *The rabbets are different lengths on the stiles and rails.* Cut the ⅜" rabbets to hold the glass and stops on the back inside edges of these pieces [**Drawing 3a**].

2 Glue and clamp the door stiles (O) and rails (P) together to make each door [**Drawing 3**].

3 Finish-sand the doors and drill the counterbores for the cup hinges [**Drawing 3a**].

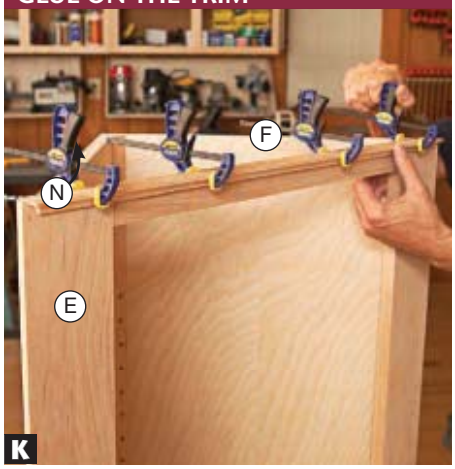
4 Cut ⅜"-wide glass stops (Q, R) from ¼" stock. Trim each piece of stop to length to fit in the door [**Drawing 3**]. Drill small holes for brads in each stop, then set them aside.

Finish it up and reflect on the job

1 Finish-sand all the parts and apply a finish. ***Note:*** *Mask off the area on the inside of the cases where the top cleats (D) will be glued* [**Drawing 1**]. (We used Minwax Cherrywood no. 607 stain with three coats of satin polyurethane as a topcoat.)

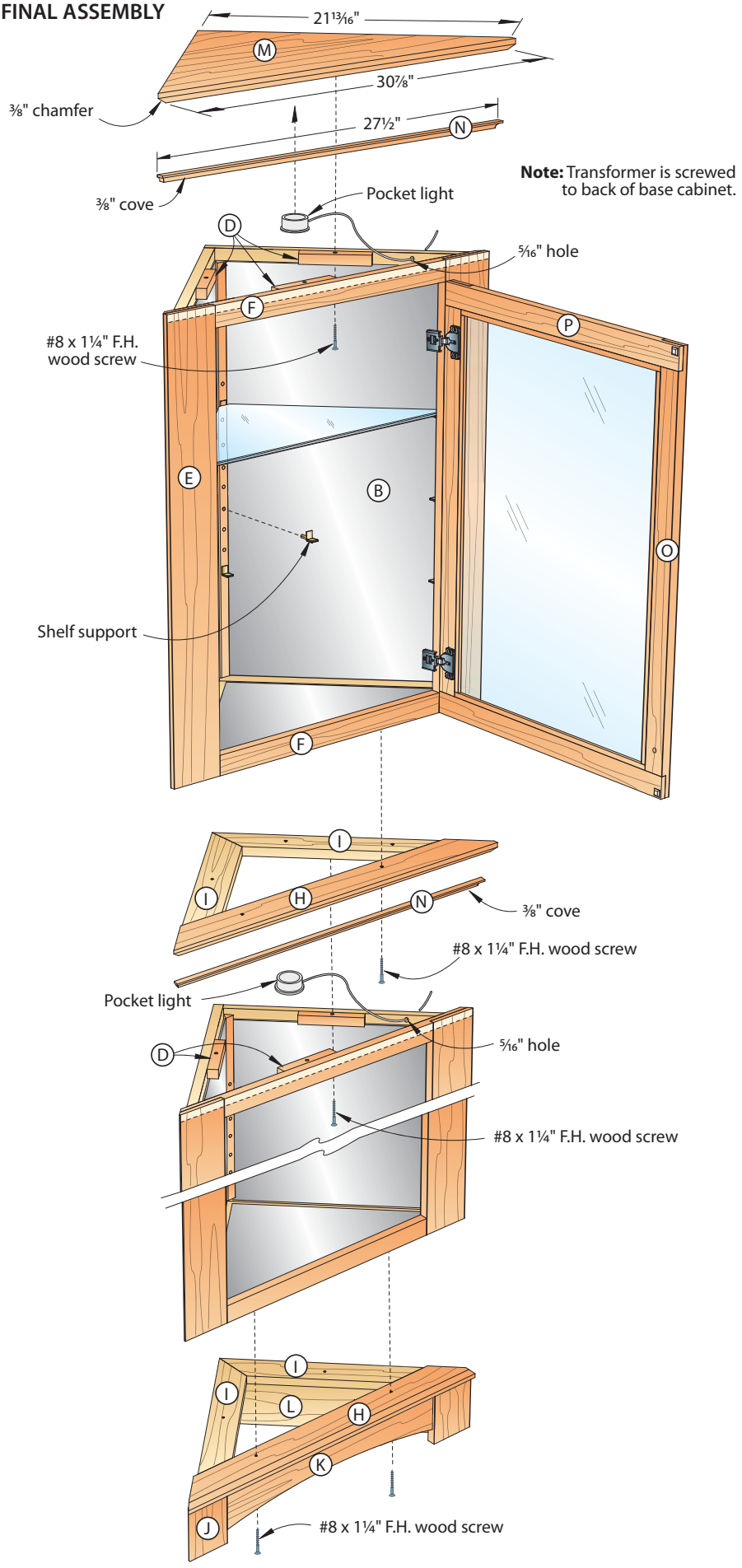
2 Measure inside the cases for the exact size of ⅛" mirrors and ⅛" glass shelves and then have a glass shop cut these to size. Apply an even coat of mirror adhesive to the back of the triangular bottom mirrors and place them on the case bottoms (C). Next, apply adhesive to the mirror backs and position them in the cases against the backs (A, B). (See **Shop Tip** *opposite*.)

GLUE ON THE TRIM



Apply glue on the back of the cove trim (N), and glue and clamp it centered along the front top edge of each case.

4 FINAL ASSEMBLY

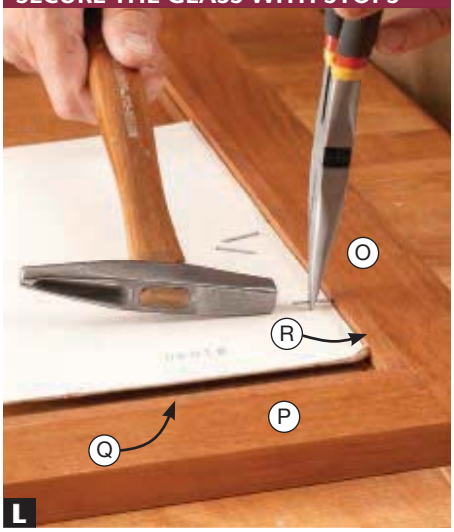


3 After the adhesive cures, retrieve the top cleats (D) and glue them in place [**Drawing 1**]. Center the upper case over the lower case and secure using #8×1¼" flathead wood screws [**Drawing 4**]. Attach the top (M) in the same manner.

4 Drill holes for the pocket-light wires [**Drawing 4**] and screw the lights to the top (M) and bottom (C) of the top cabinet. Install the glass in the doors and secure the stops (Q, R) with small brads [**Photo L**]. Attach the hinges to the doors, and mount the doors to the face frames, centering them top-to-bottom in the opening.

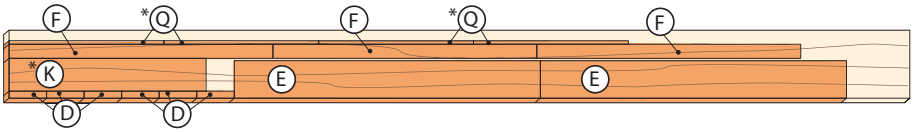
5 Mount the knobs and bumpers on the doors [**Drawing 3**] and add the shelf supports. Shine up the mirrors and glass shelves, then install the shelves.

SECURE THE GLASS WITH STOPS

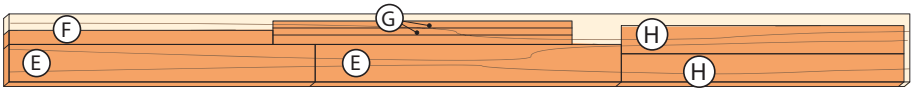


The glass stops (Q, R) are held in place with #17×¾" brads. Lay down some cardboard to protect the glass while driving the brads.

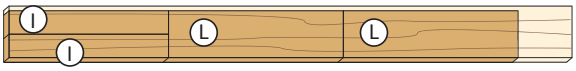
Cutting Diagram



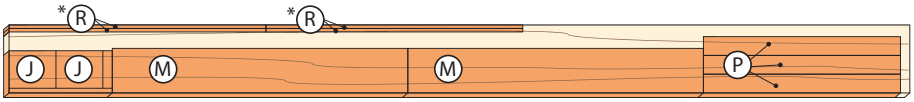
¾ x 7¼ x 96" Cherry (5.3 bd. ft.)
*Plane or resaw to the thicknesses listed in the Materials List.



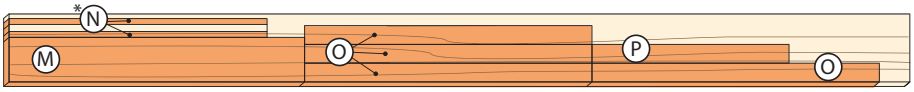
¾ x 7¼ x 96" Cherry (5.3 bd. ft.)



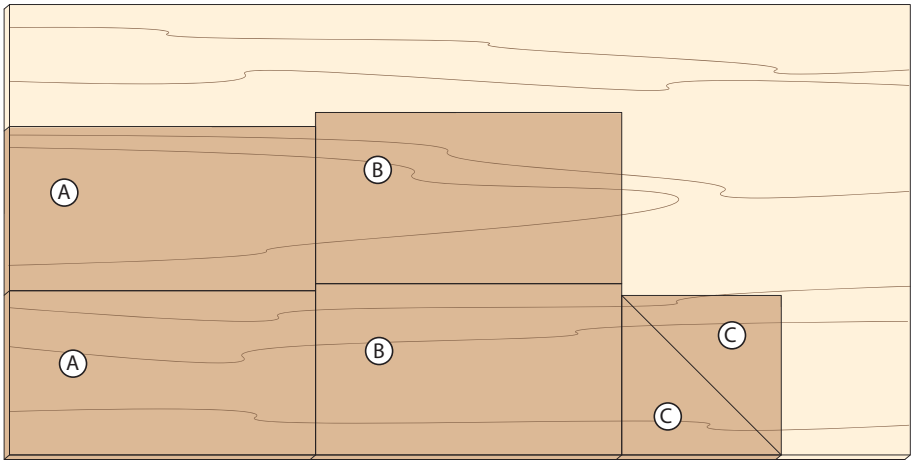
¾ x 5½ x 60" Poplar (2.5 bd. ft.)



¾ x 7¼ x 96" Cherry (5.3 bd. ft.)



¾ x 7¼ x 96" Cherry (5.3 bd. ft.)



¾ x 48 x 96" Birch plywood if adding mirrors; cherry plywood if not.

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
Cases						
A	backs	¾"	17½"	32⅝"	BCP	2
B	wide backs	¾"	18¼"	32⅝"	BCP	2
C*	bottoms	¾"	16¾"	16¾"	BCP	2
D	top cleats	¾"	¾"	4"	C	6
E	face-frame stiles	¾"	4"	32⅝"	C	4
F	face-frame rails	¾"	1½"	28⅛"	C	4
G*	shelf supports	¾"	¾"	31⅞"	C	2
Base						
H	front trim	¾"	3"	30⅛"	C	2
I	back rails	¾"	2½"	17"	P	4
J*	feet	¾"	4"	5"	C	2
K	front rail	½"	3½"	21"	C	1
L	back cleats	¾"	5"	18⅝"	P	2
M*	top	¾"	13⁹⁄₁₆"	30⅞"	EC	1
N*	cove trim	½"	½"	27½"	C	2
Doors						
O	door stiles	¾"	2"	30⅝"	C	4
P	door rails	¾"	2"	21"	C	4
Q	horizontal glass stops	¼"	⅜"	16½"	C	4
R	vertical glass stops	¼"	⅜"	27⅜"	C	4

*Parts initially cut oversize. See the instructions.

Materials key: BCP-birch or cherry plywood, C–cherry, P-poplar, EC-edge-glued cherry.
Supplies: #8×1½", #8×1¼", #8×1" flathead wood screws; #17×¾" brads; bumpers (4); #20 biscuits; ⅛×15⅜×31" mirrors (4); ⅛×16×16" mirror (cut diagonally); ⅛×16×16" glass (2, cut diagonally to yield 4 shelves); ⅛×17¾×27⅜" glass (2); shelf supports (12); European-style ½" overlay hinges (4); 1¼" knobs (2); mirror adhesive.
Blade and bits: Stack dado blade; ⅜" cove, 45° chamfer router bits; 1⅜" Forstner bit; ¼", 5⁄16" drill bits.

Source

Lights: Low-profile xenon Pocket lights no. 30394, $74.99, Rockler Woodworking and Hardware, 800-279-4441, rockler.com.

Produced by **Doug Hicks** with **Kevin Boyle**
Project design: **Jeff Mertz**
Illustrations: **Roxanne LeMoine**; **Lorna Johnson**

MORE RESOURCES

FREE PLANS AND ARTICLE

- Learn how to make a squaring brace at www.woodmagazine.com/brace.
- For more information on making and using a fairing stick, visit www.woodmagazine.com/fairing.
- "Half-Lap Joints Made Easy" www.woodmagazine.com/halflap.

Better Homes and Gardens®

WOOD® PATTERNS®

March 2011 *Issue 203*

Dear Reader: As a service to you, we've included full-size patterns on this insert for irregular-shaped and intricate project parts. You can machine all other project parts using the Materials List and the drawings accompanying the project you're building.

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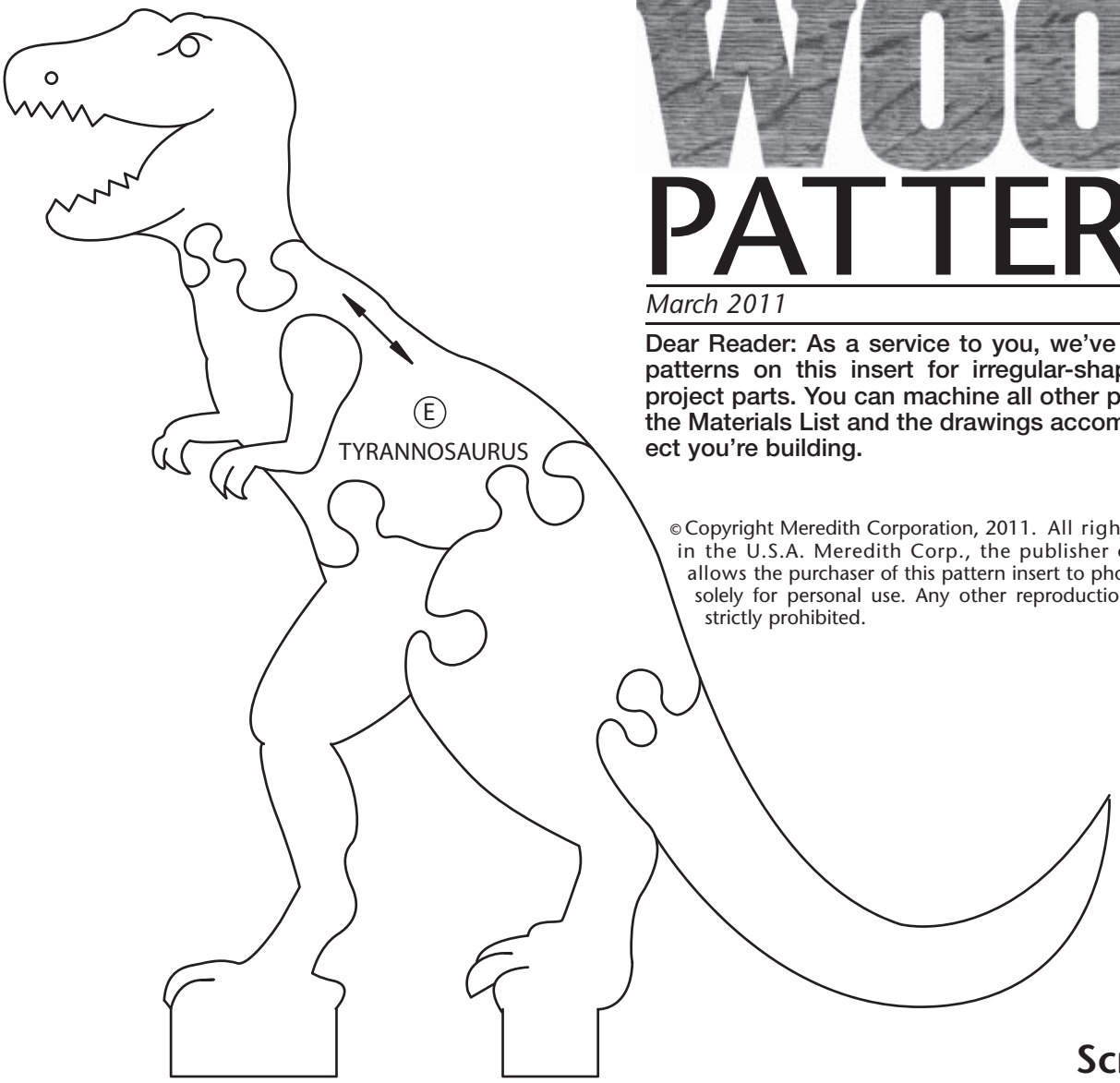
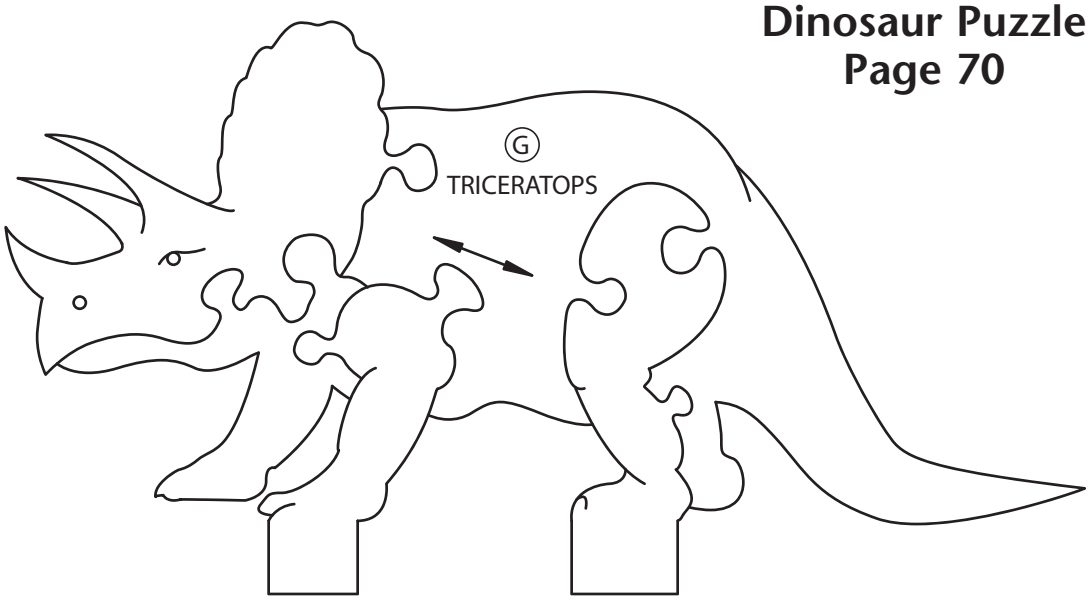
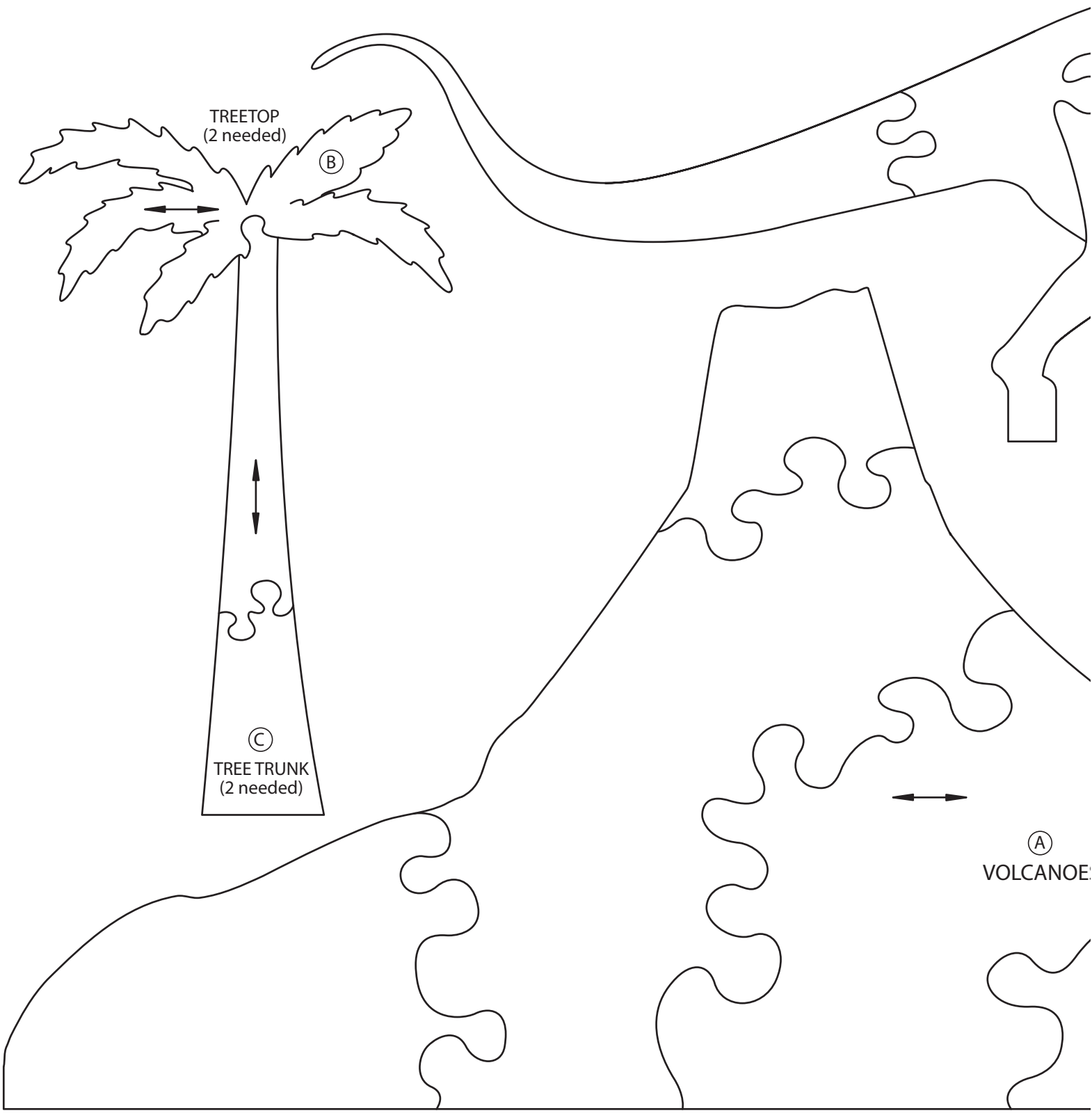


Scrollsawn Dinosaur Puzzle

Page 70

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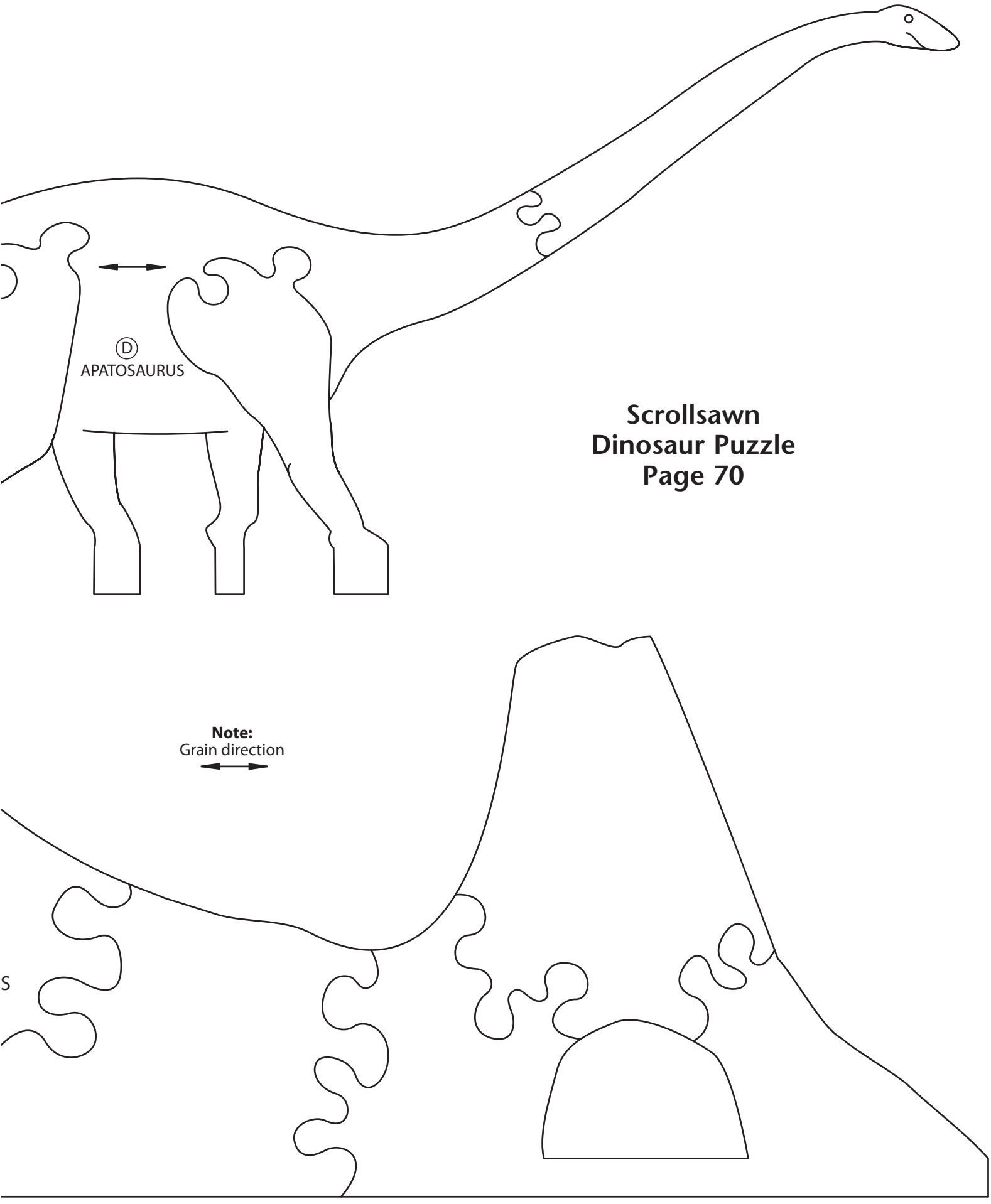

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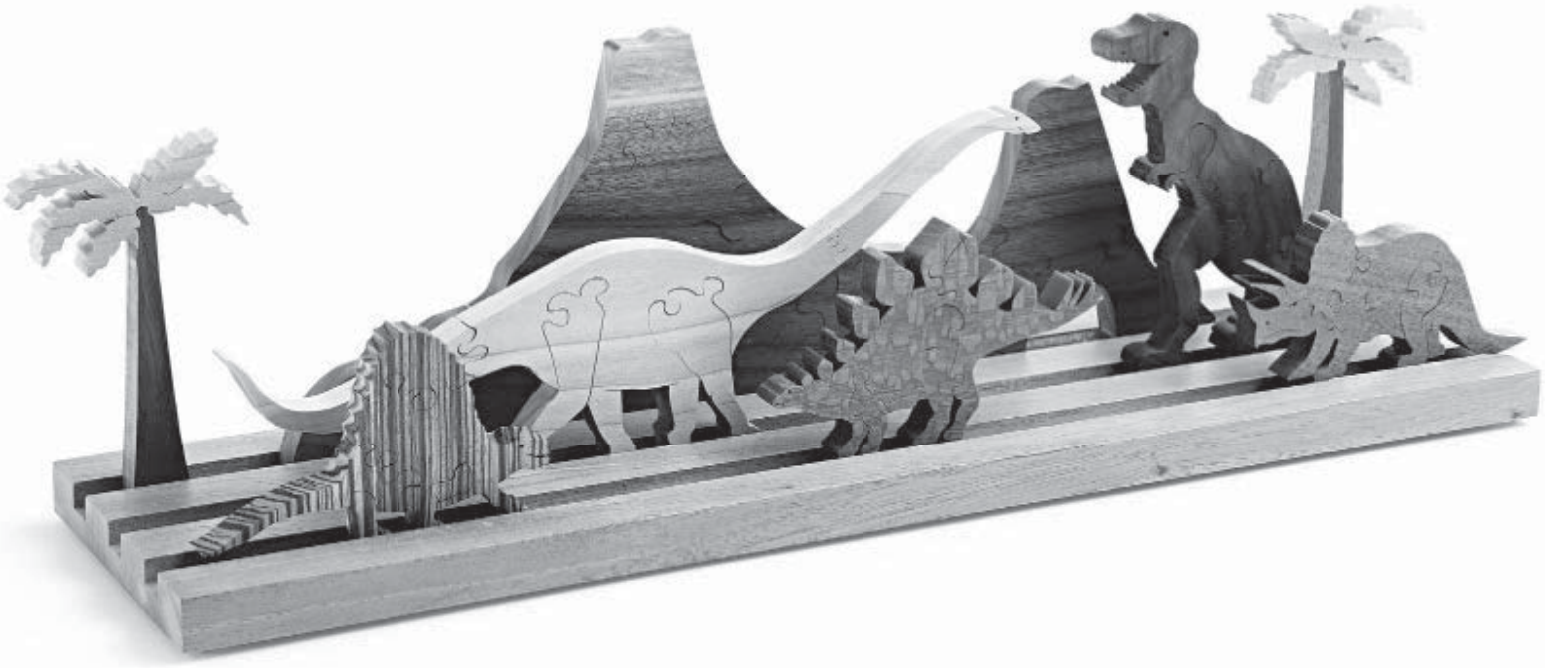

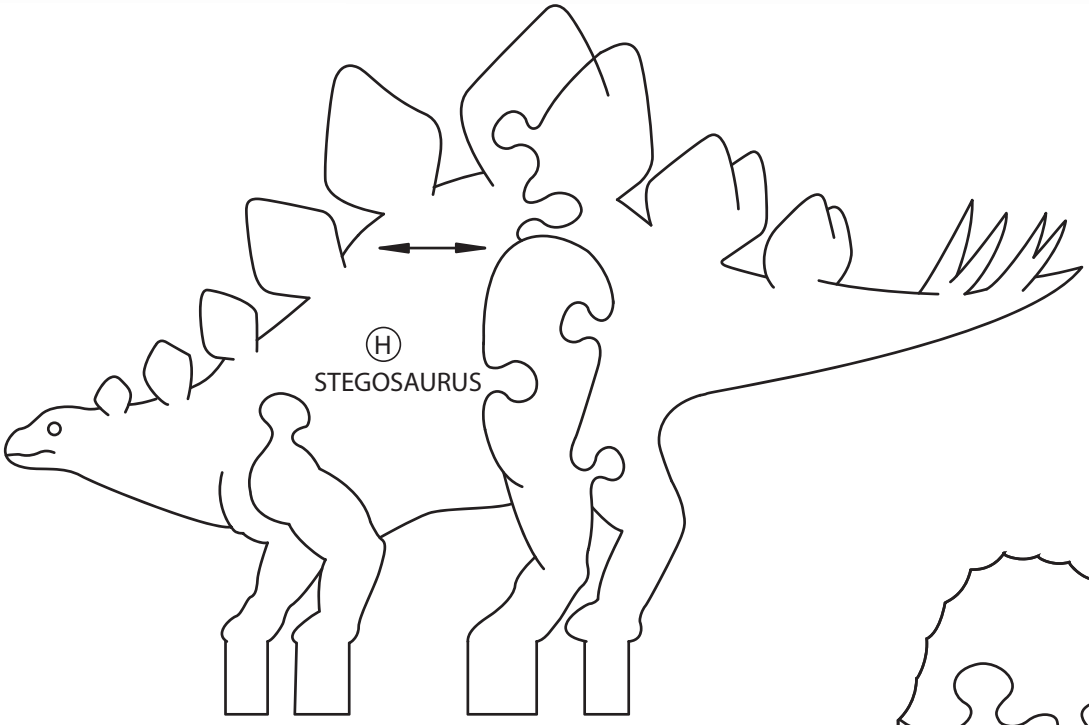
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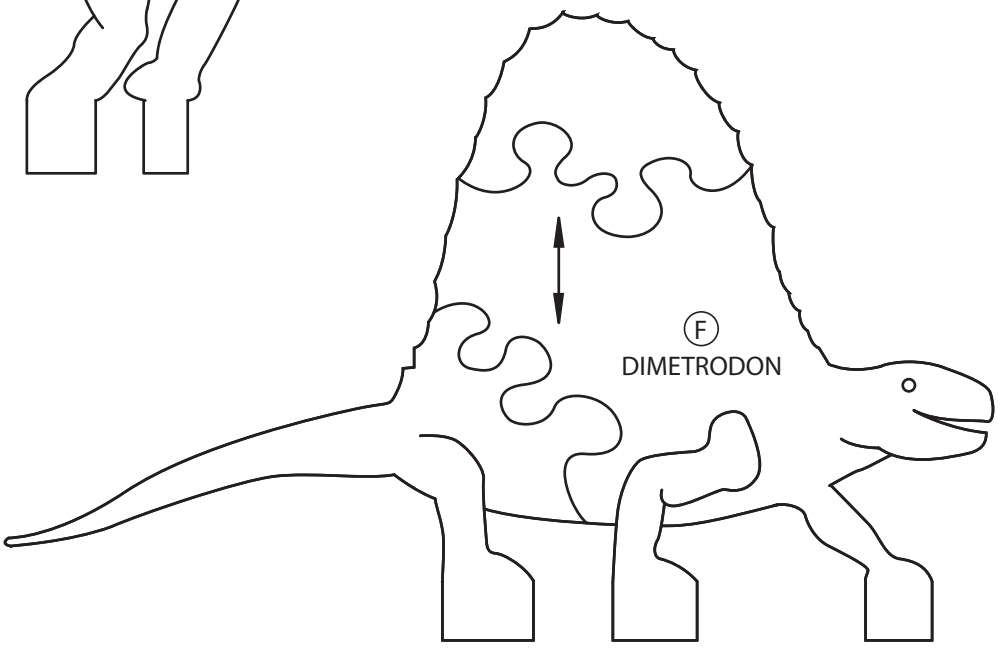

Ⓕ
DIMETRODON

Turn a Green Bowl

With just a few basic tools and these easy-to-follow steps, you'll be turning out dazzling bowls in no time.

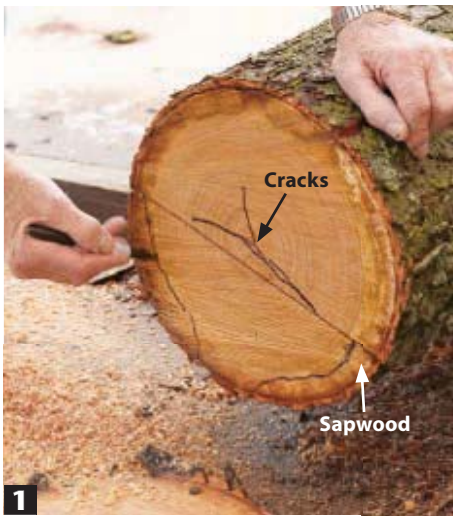
Turning a bowl from fresh-cut wood—"green," in the woodworking world—is like gambling with house money. If you mess up a piece, it's no big loss. Just grab another block from the firewood pile. And we've never yet come across a species that doesn't yield great-looking bowls.

Chuck Dowler, leader of the woodturning special-interest group of the Des Moines, Iowa, Woodworkers Association, loves to turn green wood. He agreed to show how he does it. As luck would have it, Chuck came across a few cherry logs just days before we called.

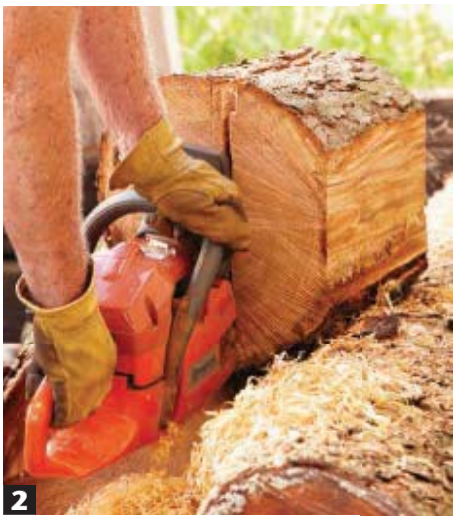
With any green wood, cracking caused by too-quick drying will be your biggest concern. So keep green-wood sealer on hand and coat the ends of any blocks or logs immediately when you get them. Because of the high moisture content of this wood, you turn a green blank about three-fourths of the way, then set it aside to dry for six months or more, depending on the thickness of your bowl. After it dries, you can turn it to final shape and apply finish.

To turn green wood you'll need a small chainsaw, a lathe of any size, a bench grinder (preferably with a sharpening jig), a four-jaw chuck with a center screw, a live center, ½" bowl gouge, a parting tool, and thickness calipers.

First, prepare the bowl blank



After cutting a couple of inches off the end, mark the location for your bowl. Position it to avoid any cracks emanating from the pith (the log's center).



Chainsaw a thin slab off the outer edge; then saw the blank away from the block. These parallel, flat surfaces make it easier to prep the blank for the lathe.

Make scrap templates of different diameters for quick and easy layout of your bowl on the blank. Be sure to mark the center hole for the chuck or faceplate mounting.

Use a handheld planer (or a hand plane) to flatten the center area. Chucks and faceplates need a flat surface for optimum grip when mounted.

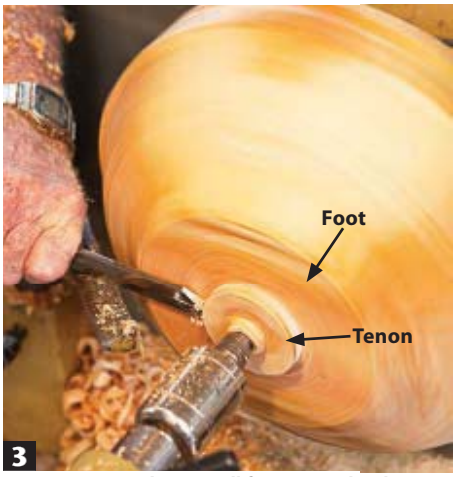
Drill a pilot hole for the screw-chuck threads in the center of the blank. Or, if you use a faceplate, drill pilot holes where needed for the mounting screws.

Bandsaw the blank round. Don't suck the moist debris into your dust collector—it could plug the filter. After sawing, clean your bandsaw to prevent tabletop rust.

Next, turn the blank to rough shape

Thread the bowl blank onto your screw-chuck with the drive spindle locked. Snug the blank up so it sits flat against the jaws around the entire chuck.

With the tailstock and live center helping to support the blank and the lathe running at its slowest speed, use a ½" bowl gouge to begin shaping the outer surface.



Turn a tenon as big as will fit in your chuck, about ¼" to 5⁄16" long. Then form a foot about 40 percent of the bowl's diameter. Square the tenon shoulders to the foot with a parting tool.

Turn the blank to rough shape (continued)

4

Define the top rim of your bowl (as marked) to eliminate the small-diameter growth rings around the pith. Keeping them will only cause your bowl to warp and crack.

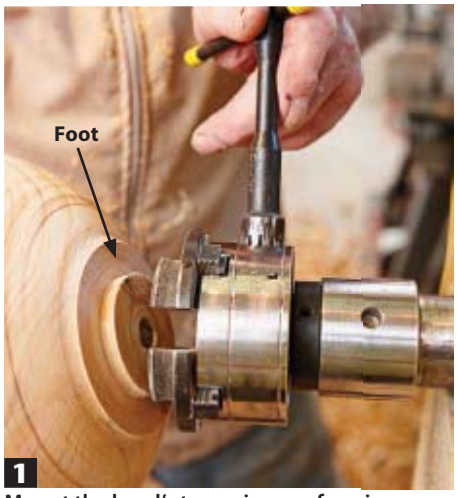
5

Step up the lathe speed to the second-slowest setting. Using your parting tool, cut a perpendicular groove into the bowl about ¾" deep along the line you just marked.

6

Peel away green-wood ribbons with the bowl gouge as you turn the bowl to its outer shape. You only need a basic shape, so don't fuss over getting it perfectly smooth.

Shape the inside of the green bowl



1

Mount the bowl's tenon in your four-jaw chuck. Be sure the bowl's foot rests flat against the jaws when tightened. If it's not, go back and make it flat.

2

With the tailstock live center supporting the bowl, remove the waste down to the bowl's rim. Use a pull cut toward you for this, holding the gouge's bevel against the wood.

3

Remove the tailstock, position your tool rest as shown, and begin hollowing the bowl. Start your gouge near the rim and make incremental push cuts toward the center.

4

Continue to make successive cuts toward the bowl's bottom. Rest the gouge's beveled edge against the bowl wall as you push the cut to maintain the shape with each pass.

5

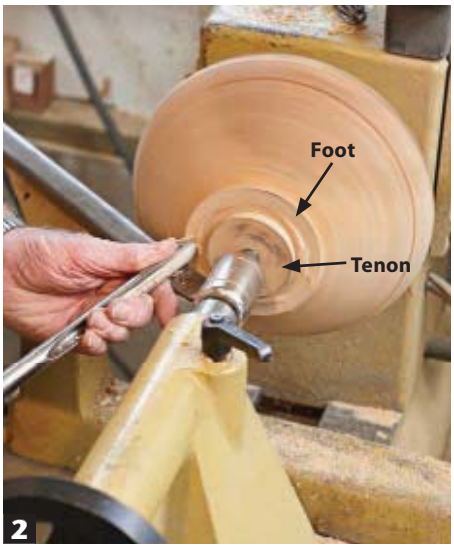
Stop turning when the bowl's wall measures about 10 percent of its diameter. For this 10" bowl, he stopped when the wall was 1" thick. Calipers like these work great for this task.

6

You've gone as far as you can; time to set the green bowl aside to dry for six months. Coat it with a wood sealer or latex paint and store it in a dry place to prevent cracking.

Jump ahead 6 months: Turn the dried bowl blank to final shape

Mount the dried bowl by trapping it between the live center and the four-jaw chuck. Use a folded sanding pad as a buffer to add grip. Center the bowl as best you can.



The bowl likely warped as it dried, so you first need to reshape the tenon round and the foot flat. Use the same ½" bowl gouge, freshly sharpened.

Turn the outer surface of the bowl to make it round again. Place the gouge's bevel against the wood near the foot and push-cut toward the rim. Use ultralight cuts to finish the shape.

As you did with the green bowl, use the parting tool to define the rim. Continue cutting until you have a rim that's true around the entire bowl.

With the bowl's outer shape to your satisfaction, sand it smooth, beginning with 120-grit sandpaper and continuing through 320 or 400. Apply finish to the bowl's outside.

Before tackling the inner shape, measure the bowl's depth from rim to foot. This lets you know how much material to remove without cutting through the bottom.

Holding the gouge as shown, push into the spinning bowl, removing about ⅛" per pass. Hold the gouge's beveled edge against the bowl wall and chase the shape to the center.

Measure the wall thickness until reaching your desired amount. Leaving the "stump" in the center serves as a gauge of how much material you've removed since starting.

After rounding over the rim, turning away the stump, and cutting to final shape, sand the inner wall smooth. A right-angle sander like this helps hide sanding scratches.

The home stretch: Trim off the tenon and apply the finish

Here's a low-cost way to hold the nearly complete bowl: a ¾"-thick MDF jam chuck on a faceplate. Use the parting tool to turn a groove equal to the bowl's rim diameter.

Your bowl should snap into the groove with just a slight push of your hand. Too tight and it could split the bowl. Too loose and it won't hold the bowl securely.

With the live center holding the bowl against the jam chuck for added support, slice away most of the tenon with light pull cuts. Do this with a freshly sharpened bowl gouge.

Remove the live center and tailstock. Secure the bowl to the jam chuck with filament packing tape; about 8 to 10 loops should be enough to hold it safely.

Making light shaving cuts to avoid loosening the bowl, pare away the tenon stub with your bowl gouge. Finally, cut a slightly concave shape on the foot so it will sit flat.

Coat the bowl with your choice of finish. Chuck prefers tung oil to bring out the natural colors of the wood. Wipe away any excess, and apply 3 to 5 coats before buffing.

MORE RESOURCES

- Watch FREE videos that show how to use and sharpen bowl gouges and other turning tools at woodmagazine.com/turning-vids.
- Download a FREE article about how to get the best yield for turning blanks from green logs at woodmagazine.com/chainsawblanks.
- To post questions about woodturning or read other questions and comments, go to woodmagazine.com/forums. Click on the woodturning link.
- For a small fee, download turning project plans from a wide selection at woodmagazine.com/turnedprojects.

Produced by **Bob Hunter** with **Chuck Dowler**

MEET CHUCK DOWLER

Although Chuck's passion is woodturning, he does own a tablesaw. It holds his coffee-maker! In addition to turning bowls, Chuck loves to turn hollow vessels, thin-stemmed goblets, eggs, and egg cups. He also teaches turning classes for the Des Moines Woodworkers in his home shop.

Sources

Right-angle sander: Item #TZ20000, $59.95, Klingspor's Woodworking Shop, 800-228-0000, woodworkingshop.com.
3" hook-and-loop sanding flex-pad: Item #FP75200, $12.95, Klingspor's.
3" hook-and-loop sanding discs: 10-packs from 60 to 400 grit, $5.75 each, Klingspor's.
Wood sealer: Anchorseal 2, 1 gallon, #150809, $21.99, Woodcraft Supply, 800-225-1153, woodcraft.com.

How to Build Cabinets the Quick-and-Easy Way

America's leading woodworking instructor, Marc Adams, shows you how to design and make your own custom cabinets.

In this article, you'll learn essential cabinetmaking skills as we build this dry sink.

There are as many approaches to building cabinets as there are cabinetmakers. We asked one of the best, Marc Adams, *right*, to show how he balances the demands of fast-but-simple construction, durability, function, and appearance to create the dry sink shown *opposite*. This dry sink is essentially a typical face-frame base cabinet, just like the ones in most kitchens, but with a base and top to give it a furniture appearance. You can easily modify this basic design and technique to fit your needs or to create a roomful of cabinets.

Though cabinets may appear intimidating to build, they require only basic skills that you can hone into furniture-making proficiency.

Marc Adams understands the value of building your own cabinets. He was a full-time cabinetmaker before opening The Marc Adams School of Woodworking in Franklin, Indiana, in 1994. In addition to teaching at his school, Marc has authored numerous woodworking books and magazine articles, and produced a series of instructional videos. (See **More Resources**, *page 63*.)

Why build when store-bought cabinets are so cheap?

Any home center offers a selection of ready-made cabinets at reasonable prices. But building your own allows you to select the hardware, wood species, finish, and other details. Store-bought cabinets are typically made of particleboard held together with staples and hotmelt glue. Building them yourself, you can use better materials and stronger joinery, and still be dollars ahead. And custom cabinets can be sized to use floor space efficiently. Ready-made cabinets come in 3" length increments and require filler strips to bridge gaps between the end of a row of cabinets and the wall.

FIRST, SELECT FROM THREE TYPES OF DOORS AND DRAWERS

As you begin designing a cabinet, consider the look of the drawers and doors, because they make up much of the visible portion of a cabinet. Choose from full-overlay, partial-overlay, or inset [**Drawing 1**].

A **full-overlay** is easiest to make because the door or drawer front rests in front of the face frame. This overlay masks any discrepancies in the fit between the face frame and the drawer or door. Marc chose this style for the dry sink.

A **partial-overlay** requires rabbeting the back faces of the door and drawer. This slightly reduces the door and drawer-face size and their exposed thickness, revealing more of the face frame.

An **inset** offers a sleek, custom look, but requires a precise fit of the drawer face and door into the face-frame openings. Precision in construction and hardware installation is critical to create even gaps around all four edges.

Make hard(ware) choices

The most important hardware decision is the type of **drawer slides**. For the light-duty use expected of most cabinets, epoxy-coated roller slides from the home center provide good performance at an economical price. (See *page 72* for other drawer-slide choices, and details on mounting them.)

Adams' Insight: If the drawer-slide manufacturer offers a mounting jig, buy one; it greatly simplifies installation.

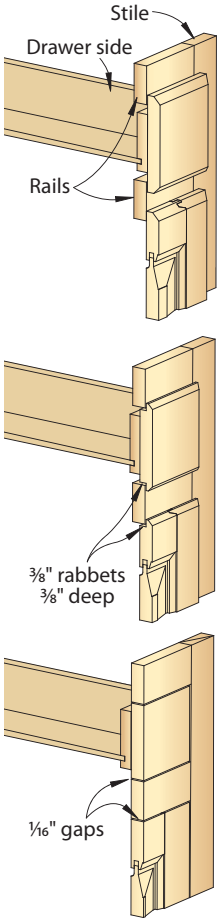
Knobs and **pulls** add character to a cabinet. You'll find hundreds of styles in catalogs and online.

The type of door determines the **hinges**. You'll find dozens of hinge choices for each type of door. The dry sink uses a 35mm European-style cup hinge with a ½" overlay [**Photo A**]. The hinges hide behind the closed door and offer easy three-way adjustability.

HINGES FOR EASY-FIT DOORS

European hinges adjust in three planes: up/down; in/out; and side-to-side for adjusting the door square with the face frame.

1 DOOR AND DRAWER OPTIONS



FULL-OVERLAY

Full thickness of drawer face and door rests on surface of face frame.

Make drawer faces and doors 1" longer and wider than openings.

PARTIAL-OVERLAY

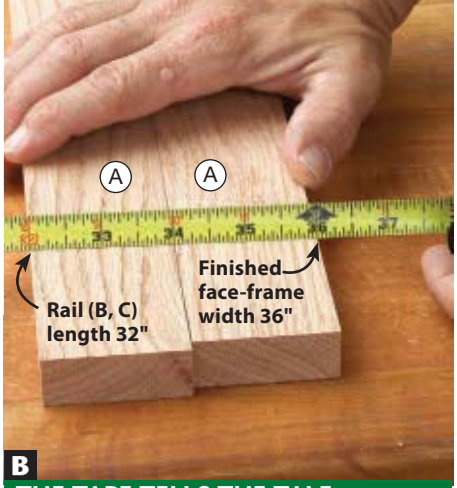
One-half of drawer-face and door thickness rests on surface of face frame.

Make drawer faces and doors ½" longer and wider than openings.

INSET

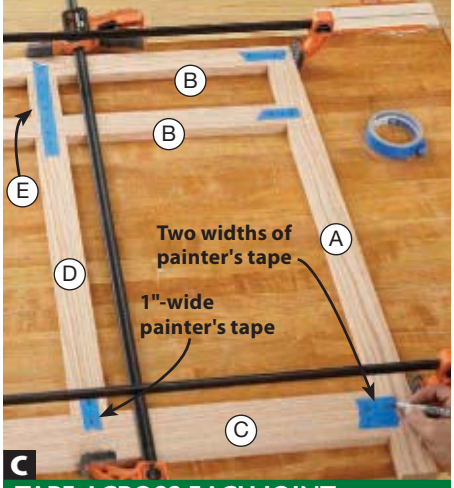
Fronts of drawer face and door rest flush with face frame.

Make drawer faces and doors ⅛" shorter and narrower than openings.



B
THE TAPE TELLS THE TALE

With the stiles (A) side by side, align the face-frame width (36") with one edge. Read the rail length (32") at the opposite edge.



C
TAPE ACROSS EACH JOINT

Label each half of each joint with matching numbers for easy repositioning of the parts after drilling the dowel holes.

D
DRILL THE DOWEL HOLES

Align the jig's ⅜"-dowel index mark with one edge of the tape. Drill the hole. Reposition to the other tape edge and drill the second hole.

START WITH THE FACE FRAME

Marc's method of cabinet construction utilizes a solid-wood face frame attached to the front of a plywood carcase. The face frame strengthens the carcase and provides mounting points for drawer slides and door hinges. Marc joins his face-frame components with dowels because they're strong, instantly align the parts, and the holes are quick to drill. Dowels also allow for cutting grooves in the assembled face frame without any danger of hitting a screw.

Adams' Insight: Cabinet carcases consume a lot of shop real estate. Save space by building the face frames first. Half a dozen face frames stack against a wall in less space than a single carcase. Take measurements for the doors and drawers from the face frames, build them, and build the space-eating carcases last.

The standard maximum width for a cabinet is 36". Beyond that, doors tend to warp, and their solid-wood panels expand excessively. For spaces wider than 36", design two narrower cabinets.

On typical 36"-tall cabinets, the face frame stops 3½" from the floor to provide toe room. However, this dry sink has no toekick, so the face frame runs the full height of the carcase. Allowing for the ¾"-thick top (V) makes the face-frame stiles (A) 35¼" long [**Drawing 2**].

Adams' Insight: You can make face-frame parts any width you like, but building them with 2"-wide material greatly simplifies math. And to further reduce the chance for errors, always take measurements directly from previously cut or assembled project parts whenever possible.

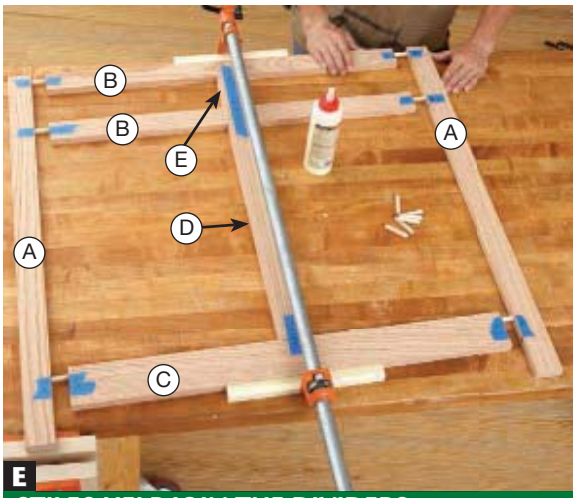
Use the stiles (A) to determine the length of the upper and lower rails (B, C) [**Photo B**].

Next cut the door divider (D) and drawer divider (E) to length.

On your bench, arrange the face-frame pieces and hold them together temporarily with 1"-wide painter's tape [**Photo C**]. The edges of the tape serve as layout marks for the doweling jig later, so center the tape across each joint. Use two strips side by side across the lower rail (C) and stiles (A).

With a razor knife, cut the tape across each joint, then drill the dowel holes [**Photo D, Drawing 2**].

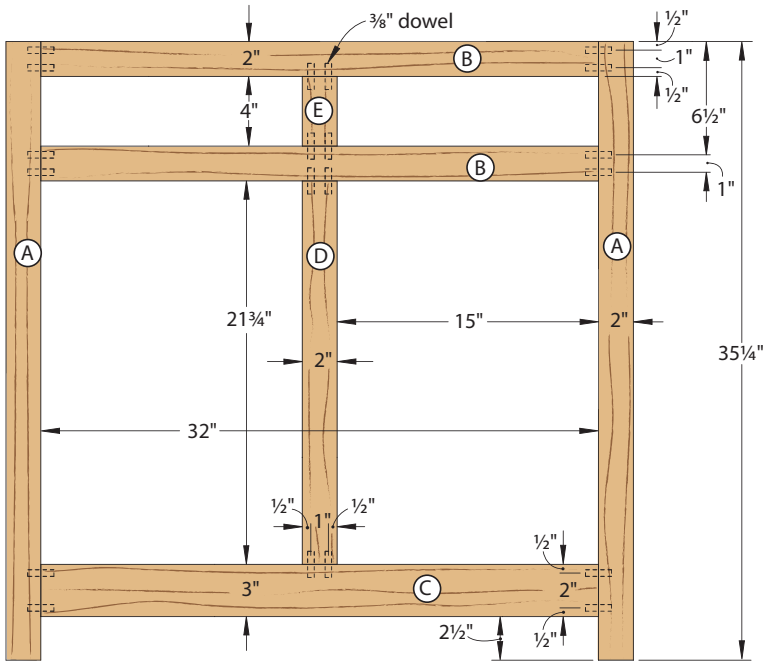
Glue and clamp the dividers between the rails [**Photo E**]. After the glue dries, glue the stiles in place, checking for square and that the frame lies flat.

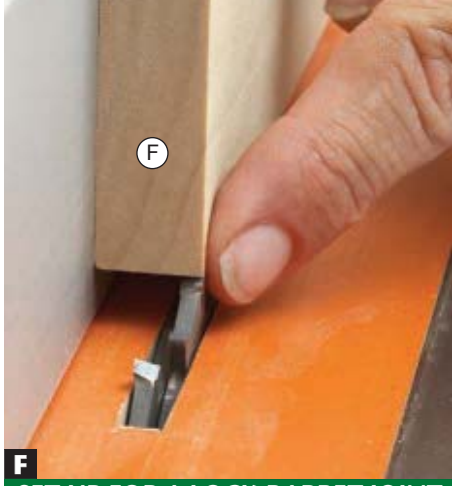


E
STILES HELP JOIN THE DIVIDERS

Dry-fit a dowel in each stile (A) joint to hold the rail (B, C) ends in position while gluing the dividers (D, E) between the rails.

2 FACE FRAME





F SET UP FOR A LOCK-RABBET JOINT

Place a drawer front (F) against the rip fence. Position the fence so the face of the front is flush with the outside edge of a tooth.

BUILD THE DRAWERS

Choices abound in drawer joinery, from simple nailed-together butt joints to the classic beauty of dovetails. Marc prefers the strong, quick-to-make **lock rabbet**, a joint that can be cut on the tablesaw with a dado blade.

Adams' Insight: Most drawer slides require a drawer box 1" narrower than the drawer opening in the face frame, allowing ½" clearance for each slide. With the face frame built, this makes easy work of determining the drawer-box width. Exact drawer height matters less, so keep the math easy by making the width of the drawer sides, front, and back 1" less than the height of the opening.

As for the length of the drawer, 22" slides are the longest that fit in a 24"-deep cabinet. Epoxy-coated roller slides have mounting brackets at the rear [**Drawing 8**]. Allowing 1" for the bracket makes the drawer length 21".

With dimensions determined, cut the drawer fronts and backs (F), and sides (G) to size [**Drawing 3**], along with an extra front to use as a test piece when setting up the tablesaw.

Mount a ¼" dado blade in your tablesaw. Use a drawer front (F) to set the rip fence [**Photo F**], then set the blade ¼" above the table [**Drawing 4**].

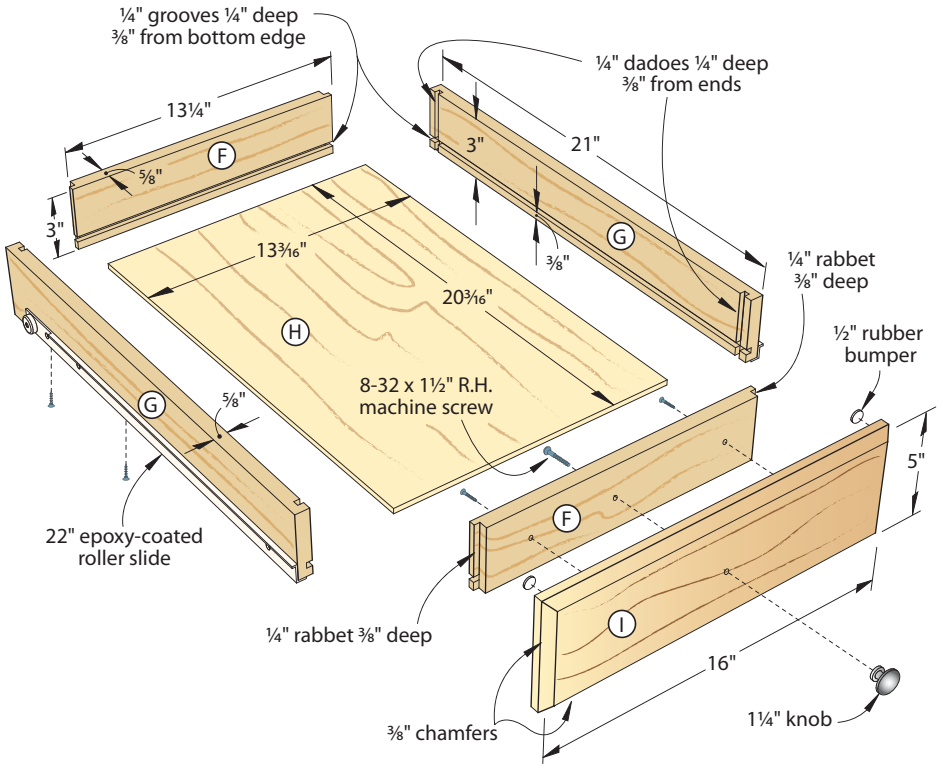
Cut a dado across each end of the drawer sides (G) [**Step 1, Drawing 4**]. With the same setup, cut a groove in the drawer sides and drawer fronts and backs (F) to accept the drawer bottoms (H). Raise the blade to ⅜" above the table, attach an auxiliary fence to the rip fence, and adjust the auxiliary fence next to the blade [**Step 2, Drawing 4**]. Make a cut on the test piece with this setup and check that the tongue fits the dadoes in the sides; then rabbet the drawer fronts and backs.

Dry-fit the drawers, and cut the drawer bottoms (H) to size to fit between the grooves, less 1/16" in each dimension. Finish-sand the parts to 220 grit, easing the sharp edges of the drawer box, then glue them up. As with the face frame, assemble them on a flat surface to prevent twist, and compare the diagonal measurements to ensure square.

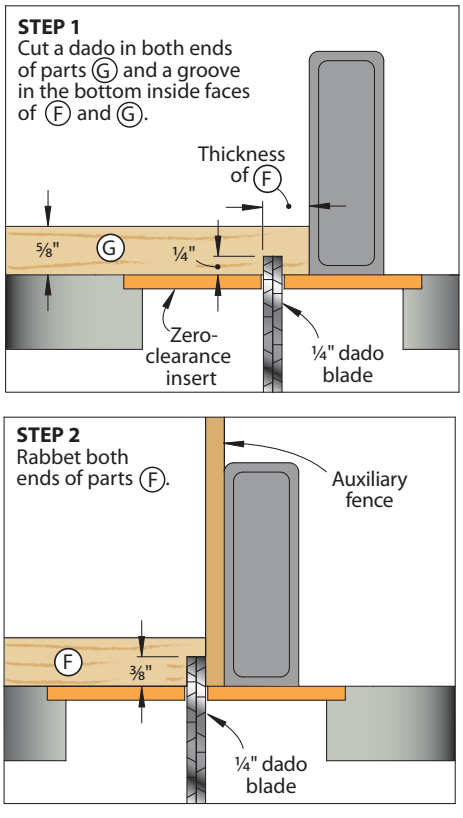
Adams' Insight: The length of the drawer faces (I) should match the door width, and the door width depends on the type of door and hinge you choose. This cabinet's doors use hinges with ½" of overlay in each direction, making the doors 1" wider than the door openings. So the drawer faces must be 1" longer than the drawer openings. Likewise, the width of the drawer face is 1" greater than the opening's height.

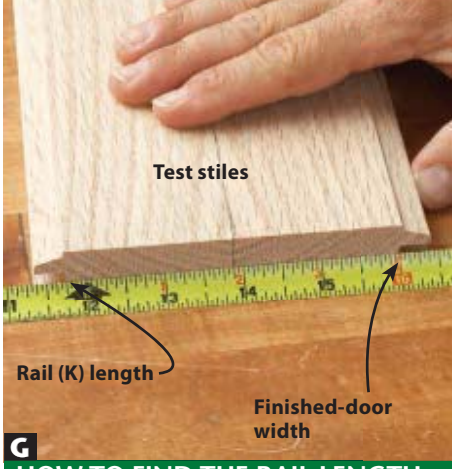
After cutting the drawer faces (I) to size, rout ⅜" chamfers around the front edges [**Drawing 3**]. Then, finish-sand them to 220 grit, and set the drawers and faces aside.

3 DRAWER



4 HOW TO CUT A LOCK-RABBET JOINT

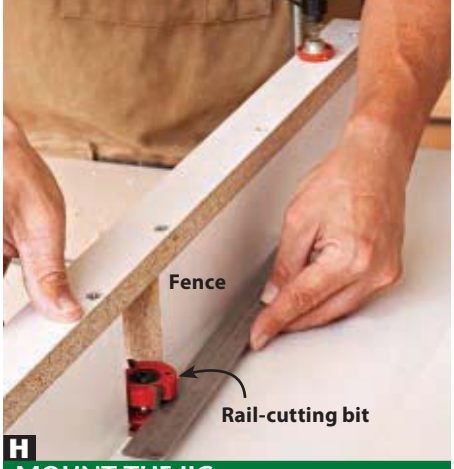




G

HOW TO FIND THE RAIL LENGTH

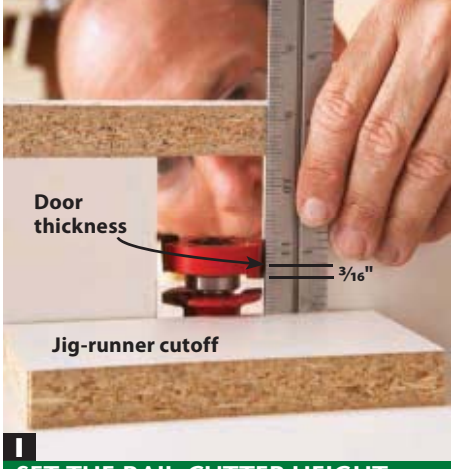
Align the finished-door width (16") with the bottom of a groove. Read the rail (K) length (11¾") at the bottom of the other groove .



H

MOUNT THE JIG

Clamp one end of the jig to the router table, align the fence with the rail-cutter's bearing, then clamp the opposite end of the jig.

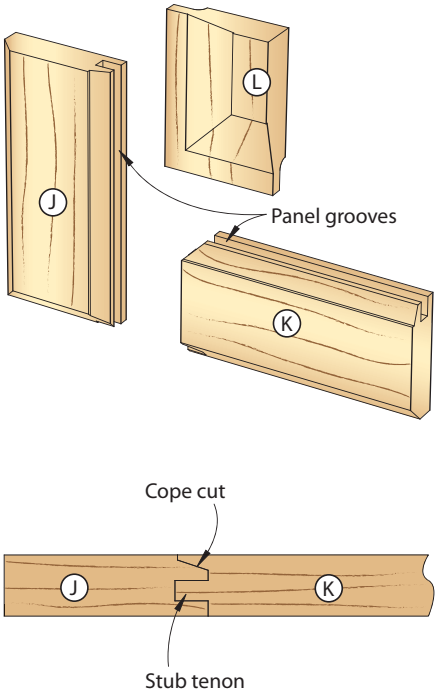


I

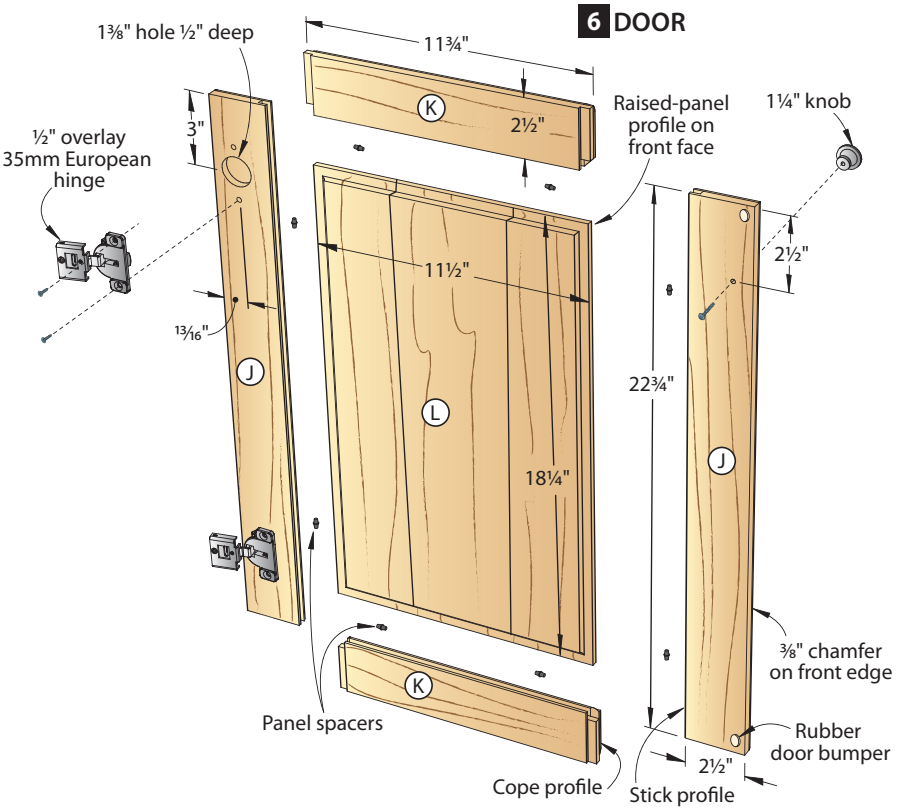
SET THE RAIL-CUTTER HEIGHT

Rest a rule on a cutoff from the jig's runner. Set the bit height to create a 3/16"-deep rabbet on the back of the ¾"-thick rails (K).

5 COPE-AND-STICK JOINERY



6 DOOR



SWING ON TO MAKING THE DOORS

Adams' Insight: I prefer a **cope-and-stick** joint [**Drawing 5**] for doors because the decorative profile adds visual interest. A special router bit (a rail cutter) forms a stub tenon on the ends of the rails (K) as it copes them to mate perfectly with the profile on the stiles (J). A mating bit (a stick cutter) mills in the rails and stiles a groove to accept the panel as it also creates the decorative profile on the outer face of the groove.

It takes test cuts to set up each bit, but once set, pieces can be routed quickly. I use the jig shown *opposite* for cutting these joints.

***Note**: Routing the raised panels for the doors requires a router with at least 2¼ hp and variable speed.*

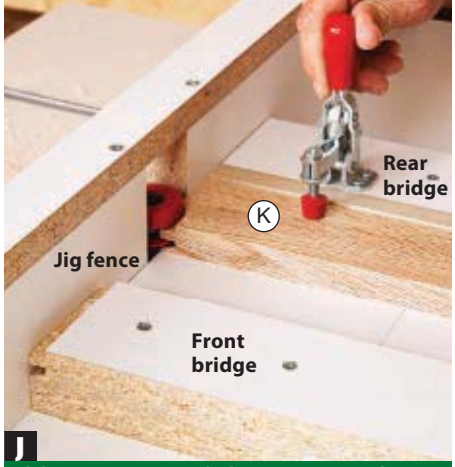
Plane stock to ¾" thick for the door stiles (J), rails (K), panels (L), and a couple of extra rails to use as test pieces, then rip them to width [**Drawing 6**]. Glue up oversize door panels, then set them aside.

Determining the length of the door stiles (J) is easy. To account for the ½" overlay at each end, cut the stiles 1" longer than the height of the door opening.

The rails (K) require a bit more math. They need to fit between the stiles, and account for the stub-tenon lengths, the width of the stiles, and the overlay.

Adams' Insight: There are a lot of chances for error to creep in when determining rail length. To get an accurate dimension, make a gauge for taking direct measurements. First, set up a stile-cutting router bit in your router table and set the height to roughly center the groove cutter on the thickness of a test piece. Make a pass along one edge of a test piece, then crosscut the piece in half.

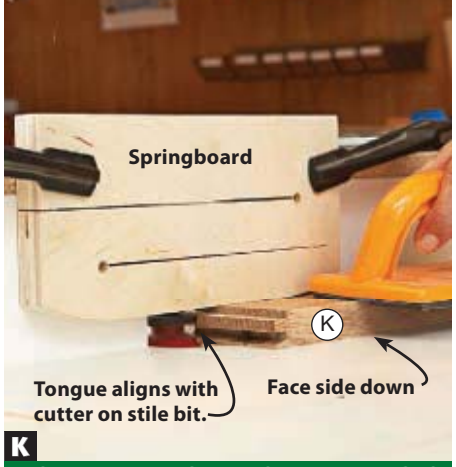
Knowing the finished width of the door (1" more than the door-opening width—16" in this case), place the test stiles back to back and take one simple measurement to determine the rail length [**Photo G**].



J

COPE THE ENDS OF THE RAILS

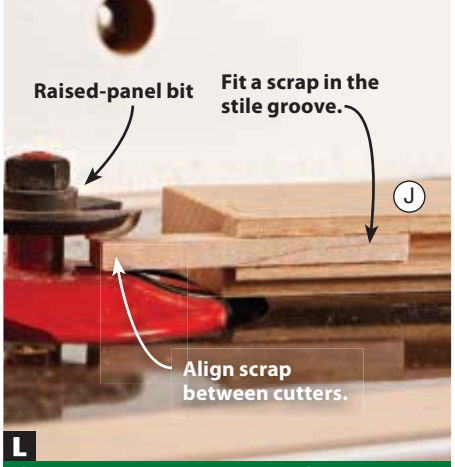
Clamp a rail (K) onto the sled, tight to the jig fence and the backer board. Cope each end of each rail, keeping the face side down.



K

ROUT THE PROFILE ON ALL PIECES

With a springboard applying consistent downward pressure, use a push pad to keep the piece against the fence as you rout.

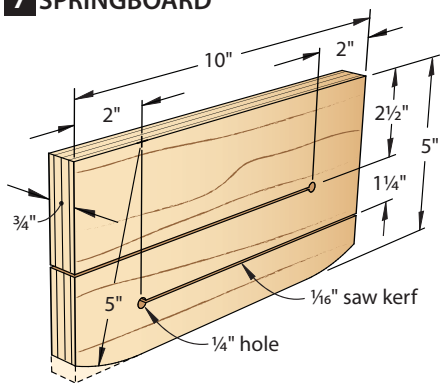


L

SET THE PANEL BIT HEIGHT

To make the panel's (L) face flush with the door face, use a stile (J) to help adjust the raised-panel bit height as shown.

7 SPRINGBOARD



Clamp the cope-and-stick jig to your router table [**Photo H**], then adjust the height of the rail-cutting bit [**Photo I**]. With the good face of each rail (K) down on the jig, cope the ends [**Photo J**].

Install the stick cutter in the router table. Using the coped end of a rail (K) as a gauge, align the cutter on the bit with the tongue of the rail [**Photo K**]. Clamp a springboard [**Drawing 7**] or featherboard to the jig fence, then rout the inside edge of each stile (J) and rail.

Retrieve the door panels (L). To allow for expansion and contraction of the solid-wood panels, cut them ¼" narrower than the length of the rails (K).

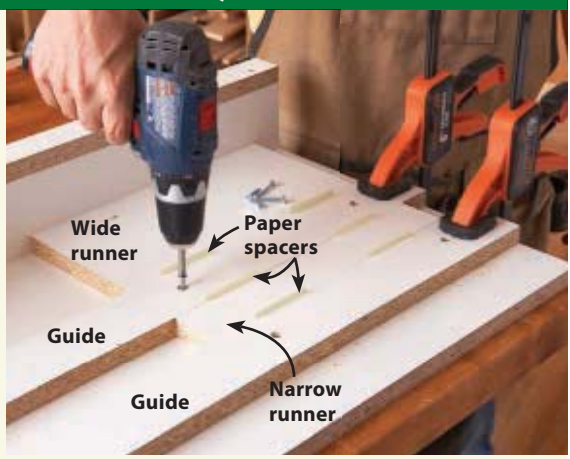
To determine the length of the door panels, put the rails edge to edge, align the 22¾" (the length of the stiles) mark of your tape at the bottom of one groove, and read the measurement at the other groove. Subtract ¼" from this measurement to keep an even reveal around the panel. Cut the panels to size.

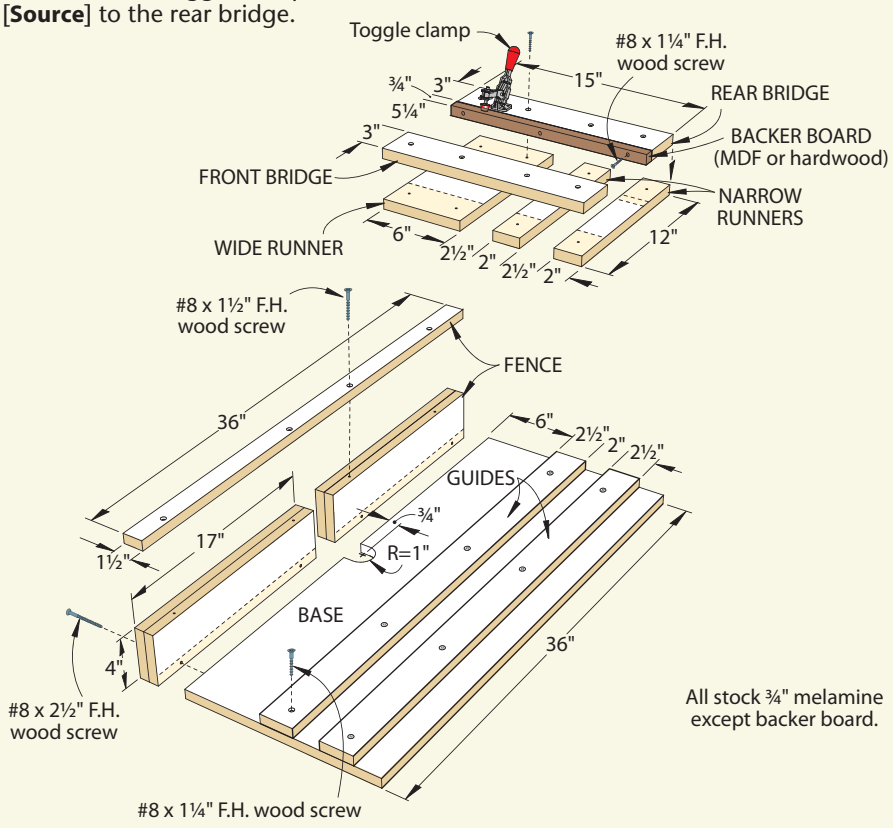
Remove the jig from the router table, and mount a raised-panel bit in the router [**Photo L**].

COPE-AND-STICK JIG IMPROVES CUT QUALITY

To cut the cope-and-stick joints, build the jig illustrated *below*. First, cut the 1"-radius bit opening in the base, then glue and screw the fence to the base. To ensure that the guides sit parallel to the fence, place the wide runner against the fence, then position the guides with a narrow runner and paper spacers between them, *right*. Screw the guides in place.

Screw, but don't glue, a replaceable backer board to the front edge of the rear bridge. Position the remaining narrow runner to the outside of the guides, then screw the rear and front bridges to the runners, square to the fence. Screw a toggle clamp [**Source**] to the rear bridge.





All stock ¾" melamine except backer board.

Adams' Insight: If the hole in your router-table insert plate is too small for the raised-panel bit, make a new insert from hardboard or plywood.

Position the router-table fence to reveal about one-third of the bit's profile. Set the router to its slowest speed. Rout the raised panel in several passes, moving the fence back between each pass to reveal more of the bit until, on the final pass, the bit's bearing aligns with the router-table fence.

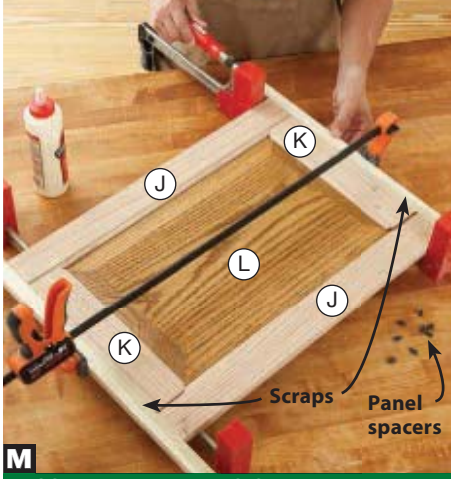
Dry-fit the door with the panel to test the fit, then disassemble it. Finish-sand the profiles on the stiles (J) and rails (K). Finish-sand the panel (L) and apply a stain to it. (We used Varathane gel stain no. 21179 Early American.)

Adams' Insight: Staining the panel before assembly prevents unstained edges from showing when the panel contracts due to seasonal wood movement.

Brush glue on the rail (K) tenons, insert two panel spacers [**Source**] in each groove [**Drawing 6**], and clamp up the door [**Photo M**]. Do not apply any glue to the panel. Check that the assembly remains flat and square.

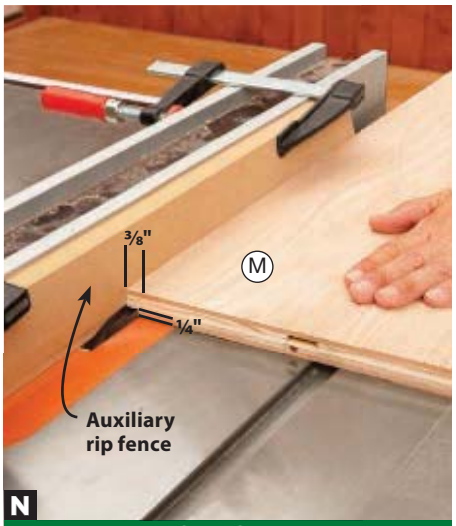
After the glue dries, drill the hinge cup holes [**Drawing 6**].

Adams' Insight: Don't fret if you can't find a 35mm Forstner bit. A 1⅜" Forstner bit measures 34.925mm and works fine.

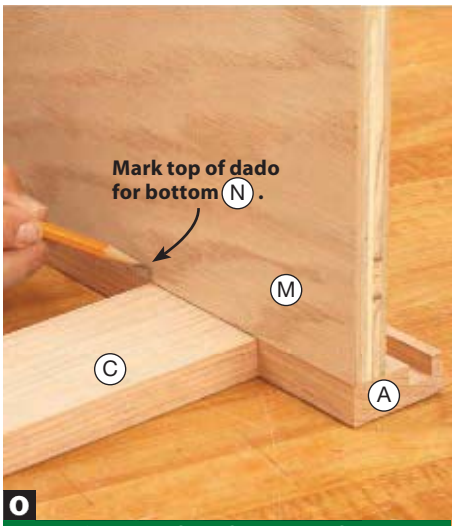


M
ASSEMBLE THE DOOR
Scraps align the tops of the rails (K) with the ends of the stiles (J). Remove the scraps after tightening clamps against the stiles.

Rout ⅜" chamfers around each door front to match the drawer profile, then finish-sand the rails and stiles to 220 grit.



N
RABBET THE SIDES
Cut a ⅜" rabbet, sneaking up on the blade height to create a tongue that fits the groove in the face-frame stiles (A).



O
MARK THE BOTTOM DADO
Position a side (M) flush with the bottom of the face-frame stile (A) and mark the position of the top of the lower rail (C).

Plywood balances durability and expense

Adams' Insight: Sheet goods make carcase construction quick and easy. Although particleboard and MDF are widely used in commercial cabinets, plywood better tolerates damp kitchen and bathroom conditions. It comes in a variety of species, even prefinished. A single sheet of ¾" plywood yields one cabinet using the methods shown here. (See **More Resources** for tips on working with sheet goods.)

For a series of base cabinets mounted side by side, as in a kitchen, save money by choosing plywood with a lower-grade veneer, then covering only the exposed face of the end cabinet with ¼" plywood to match the face-frame material.

CREATE THE CARCASE

Size the sides (M) [**Drawing 8**] to create a 24"-deep cabinet with the face frame attached. (Allow for the ⅜"-deep groove cut in the stiles in the next step.)

Mount a ½" dado blade in your tablesaw. Retrieve the face frame (A–E) and cut a ⅜"-deep groove on the inside face of each stile (A) [**Drawing 8**].

Adams' Insight: Cutting the groove ¼" from the edge leaves extra stock on the edge of the face frame that you'll need if you have to scribe the frame for a tight fit to a wall. For a row of cabinets, it also provides ½" of "fudge" room with each cabinet for fitting them in place.

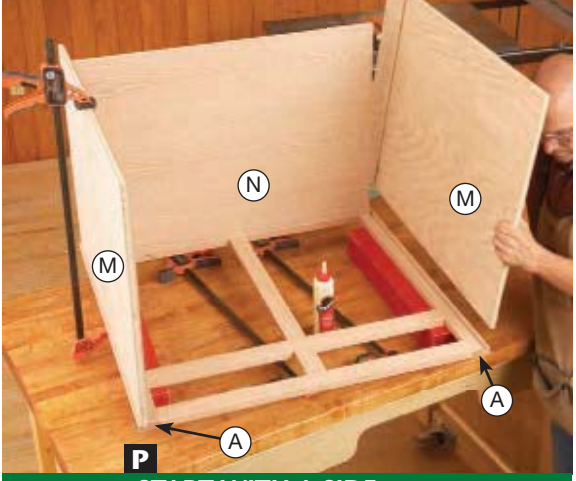
Attach a ¾"-thick auxiliary face to the tablesaw rip fence. Raise the blade ⅜" into the outside edge of the auxiliary fence, then reposition the fence, lower the blade, and cut a rabbet in the front edge of the sides (M) [**Drawing 8, Photo N**]. Slide the fence over to expose ¼" of the blade, and rabbet the inside back edges of the sides to accept the back (O).

Without changing the blade height, add chippers so the dado set matches the thickness of the bottom (N). (See **More Resources** for a free video to help with this.)

The top face of the bottom (N) aligns with the top edge of the lower rail (C). Transfer this location to the sides (M) [**Photo O**] and cut the dado for the bottom in both sides.

Adams' Insight: Leaving the blade at the same height when cutting the rabbets that accept the back and the dadoes that accept the bottom makes the length of the bottom and the width of the back identical.

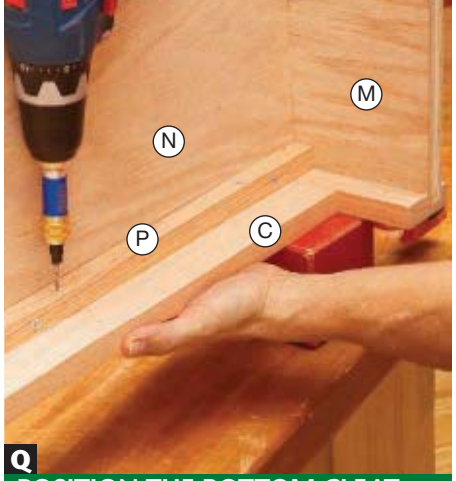
Measure between the grooves in the face-frame stiles (A) to find the *length* of the bottom (N) and the *width* of the back (O). Measure between the rabbets in a side (M) to determine the bottom's width. The back's length equals the distance from the top of a side to the dado's



P

START WITH A SIDE

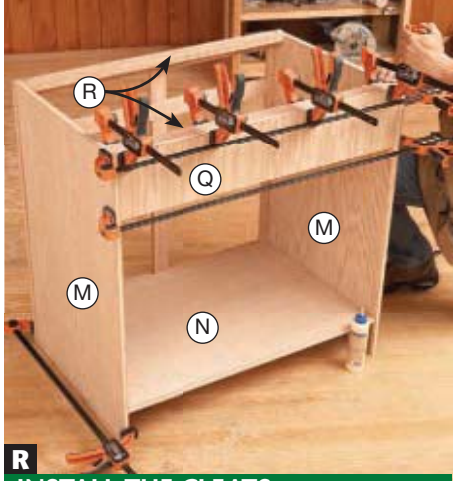
Glue a side (M) into a face-frame stile (A), with their tops and bottoms flush. Add the bottom (N), then the remaining side.



Q

POSITION THE BOTTOM CLEAT

Position the bottom (N) flush with the top of the lower rail (C). Screw the bottom cleat (P) to the lower rail and bottom.

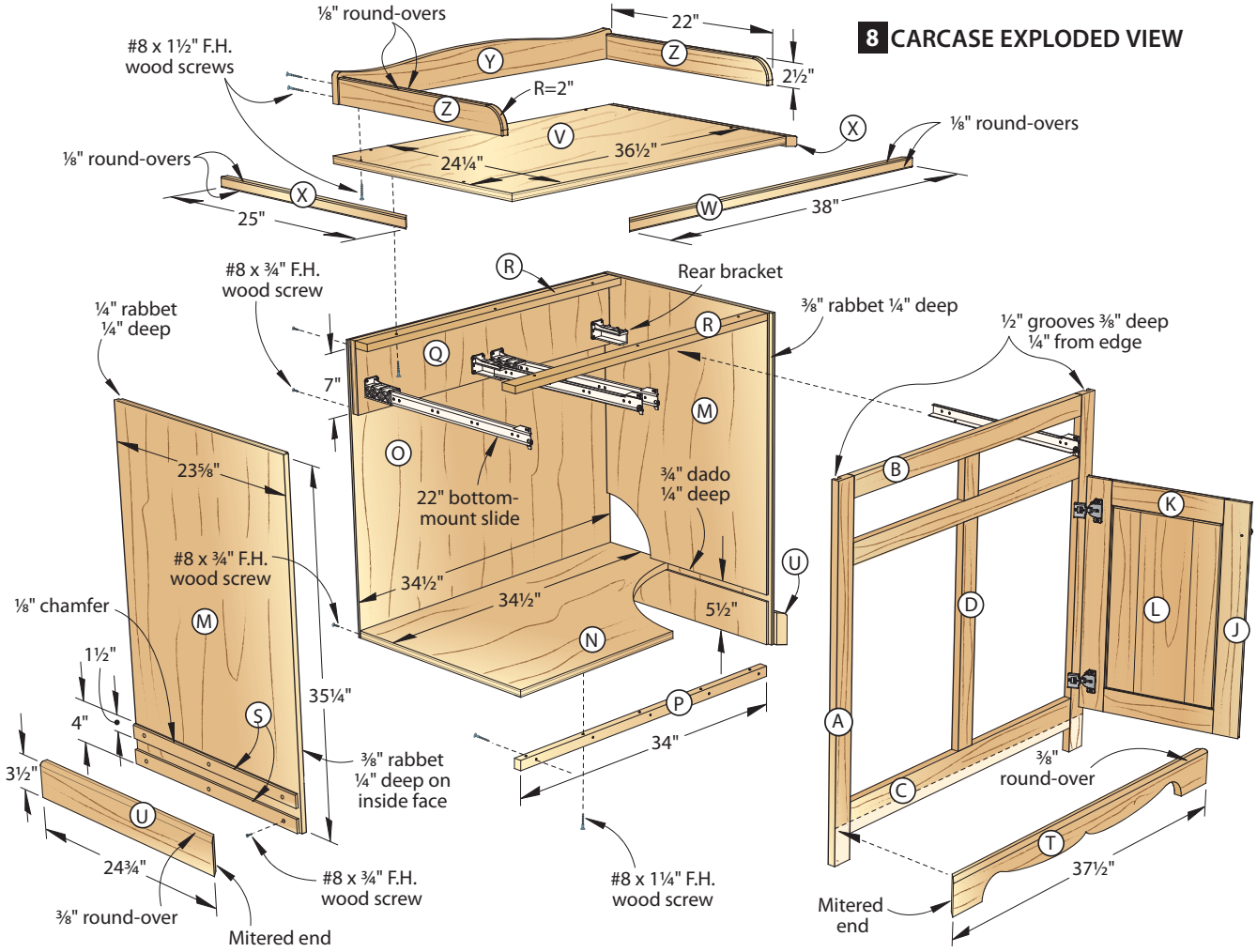


R

INSTALL THE CLEATS

Glue a top cleat (R) to the top rail (B). Glue the back cleat (Q) to the rear top cleat (R) and sides (M), flush with the rabbets.

8 CARCASE EXPLODED VIEW



bottom edge. After determining these dimensions, cut the pieces to size.

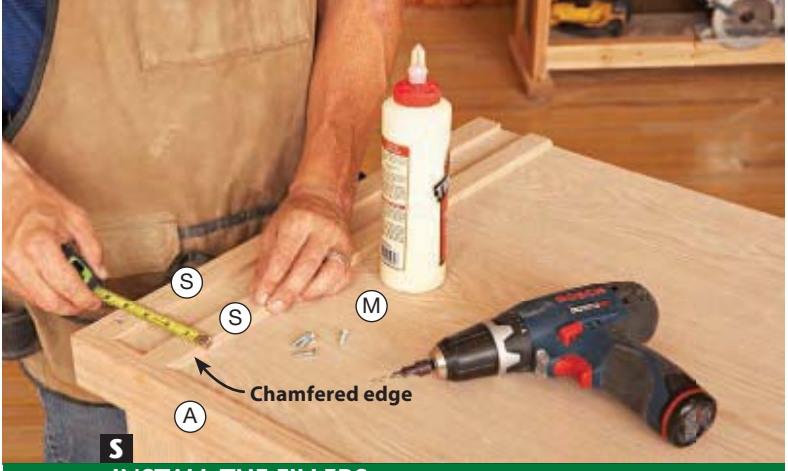
Adams' Insight: Making the back flush with the bottom prevents it from hanging up on a high spot on the floor, and, if you're making several cabinets, also allows for three backs instead of two to be cut from a single sheet of plywood.

***Note:** If you plan to brush on a finish, apply it to the inside faces of the sides (M), bottom (N), and back (O) now.*

(For a topcoat, we applied three coats of wipe-on polyurethane, buffing lightly with 320-grit sandpaper between coats.)

Adams' Insight: Applying only clear finish to the interior leaves it lighter, making it easier to see inside.

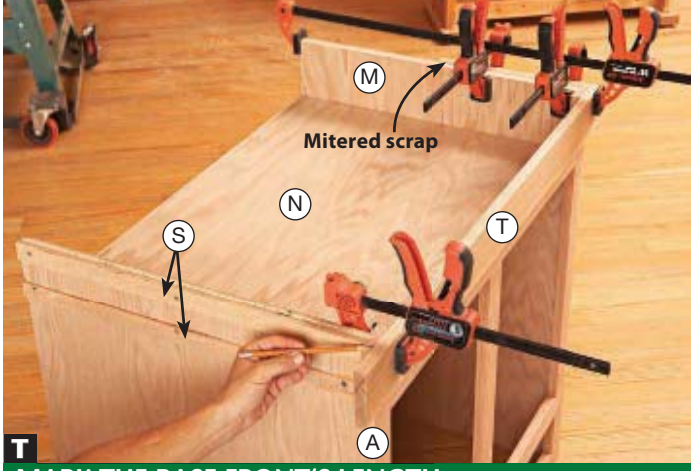
Begin assembly of the carcase as shown in **Photo P**. Screw the bottom cleat (P) in place next [**Photo Q**]. Cut the back cleat (Q) and top cleats (R) to fit between the sides (M) [**Drawing 8**]. Drill countersunk shank holes in the top cleats and glue them in place with the countersinks on the bottom face [**Photo R**]. Glue in the back cleat, then glue and screw the back (O) in place.



S

INSTALL THE FILLERS

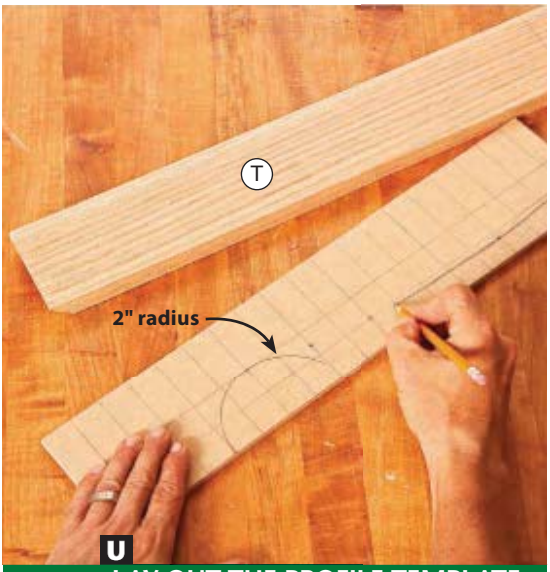
Glue and screw the chamfered fillers (S) 4" from the bottom, and the unchamfered fillers flush with the bottoms of the sides (M).



T

MARK THE BASE FRONT'S LENGTH

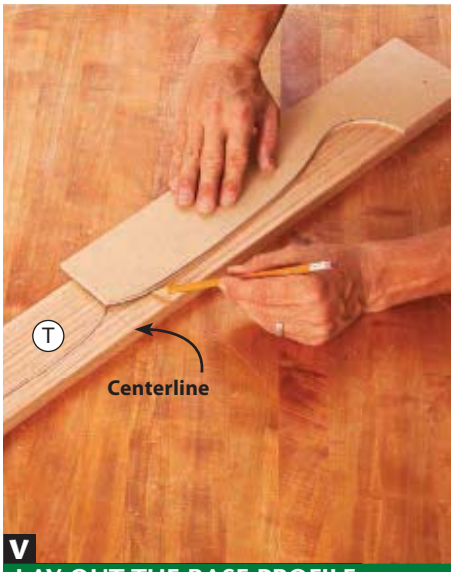
Create a tight joint with the mitered scrap and base front (T), then mark the length of the base front at the face-frame stile (A).



U

LAY OUT THE PROFILE TEMPLATE

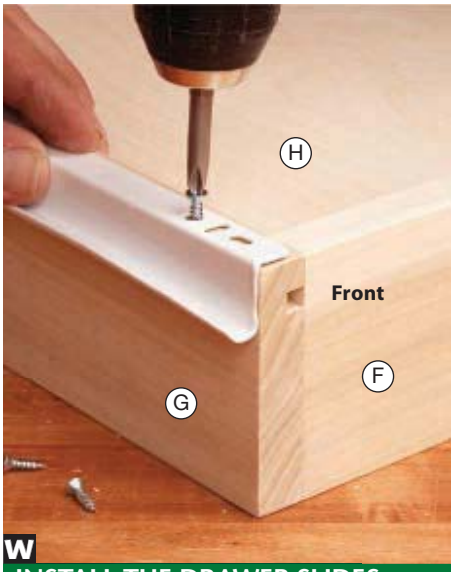
Lay out the 2" radius and several points in the arc. Connect the dots and radius with a sweeping line. Cut and sand to the line.



V

LAY OUT THE BASE PROFILE

Draw a centerline on the base front (T). Trace around the template on one side, then flip the template and draw the other half.



W

INSTALL THE DRAWER SLIDES

Mount the drawer half of the slides on the bottom edge of each side (G), flush with the front of the drawer.

TRIM IT UP AND APPLY A FINISH

Plane stock for the fillers (S) to fit the gap between the edge of the face-frame stiles (A) and the sides (M). Rip the fillers to width [**Drawing 8**] and crosscut them to fit between the rear face of the stile and the rear edge of the sides. To dress up the visible edge, rout a ⅛" chamfer on two of the fillers, then glue and screw the fillers in place [**Photo S**].

Cut the base front (T) 2" longer than the cabinet's width, and the base sides (U) 2" longer than the cabinet's depth, and rout ⅜" round-overs along the top edges [**Drawing 8**]. Miter one end of each piece and a ¾×3½×12" piece of scrap. Clamp the base front and the scrap to the cabinet and mark the opposite end of the base front [**Photo T**].

Miter-cut the base front (T) to length, then clamp the base pieces around the cabinet. Mark the length of the base sides (U), and crosscut them. On a piece of ¼" hardboard, lay out a 1" grid and transfer the **Base Front Pattern** to it [**Drawing 9**, **Photo U**].

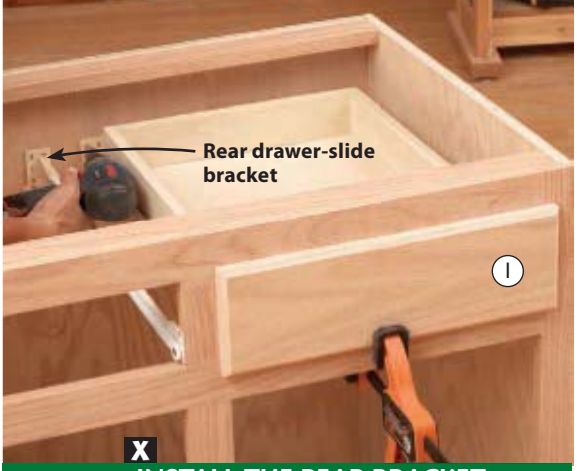
Adams' Insight: Don't worry about matching the exact shape of the pattern; instead, work for a smooth, flowing line close to what's shown.

Cut and sand the template to shape, then use it to lay out the profile on the base front (T) [**Photo V**]. Cut and sand the profile, then glue the base pieces around the carcase.

Screw the drawer half of the slides to the drawers [**Photo W**], then mount the cabinet portion of the slides to the face frame only.

With the drawer faces (I) facedown on your bench, position the drawer boxes (F/G/H) on the faces ¾" from the bottom edge and centered side-to-side. Drive screws from inside the drawer to secure the faces. Clamp a drawer in place [**Photo X**], position the drawer-slide rear brackets and tack them in place. Test the drawer operation, then drive the bracket screws. Repeat this for the remaining drawer. Install the hinges in the doors [**Photo Y**], then hang the doors [**Photo Z**].

Cut the top (V) to size from ¾" plywood [**Drawing 8**]. Cut the front trim (W) and side trim (X) to width and 2" overlength, and rout ⅛" round-overs on the top and bottom edges. Miter the trim to fit around the top using the same technique as used with the base trim. Then, glue the trim in place, keeping the



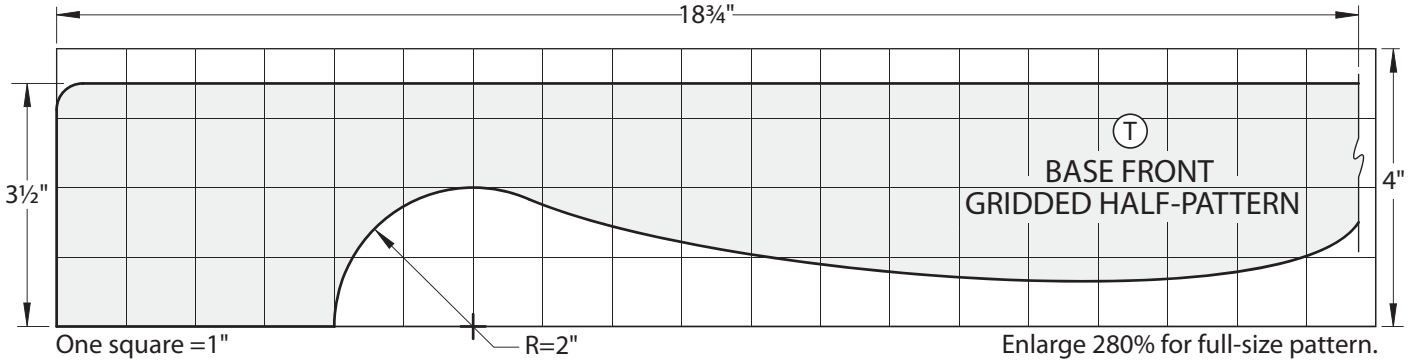
INSTALL THE REAR BRACKET

Use a drawer to find the rear-bracket location. The slotted bracket holes allow for minor adjustments side-to-side and up and down.

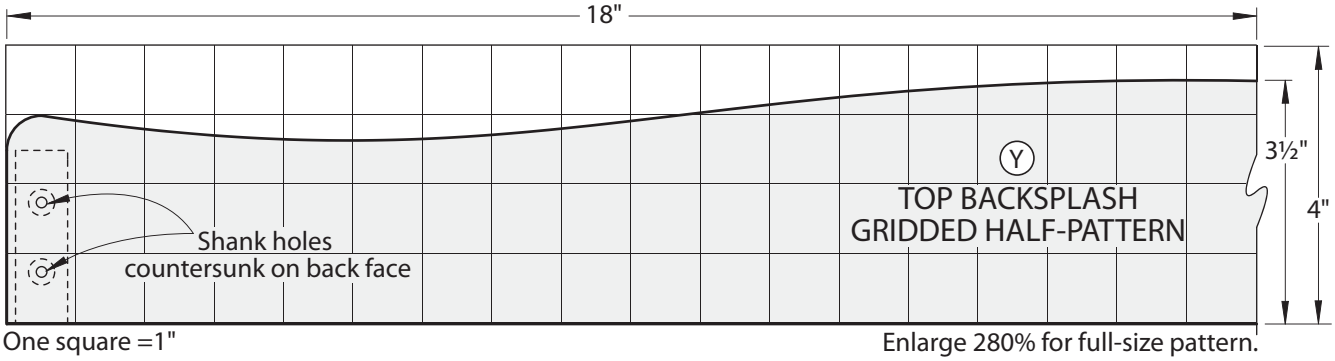
MOUNT THE HINGES AND DOORS

Use a square to align the hinges as you drive the screws, *left*. Set the cabinet on its back and place a 1"-wide spacer below the drawer face (I), *right*. Install the door so when closed, it rests against the spacer. Use the hinge-adjustment screws for fine-tuning the door position.

9 BASE PATTERN



10 BACKSPLASH PATTERN



top faces flush. Finish-sand the top (V/W/X) to 220 grit after the glue dries.

As with the base, create a template [**Drawing 10**] for the backsplash (Y). Cut the backsplash and splash sides (Z) to size and shape [**Drawing 8**]. Round over the top edges and rounded front ends of the splash sides, then sand the splash sides and backsplash to 220 grit. Screw the backsplash to the top (V/W/X), flush at the rear and centered side-to-side. Then screw the splash sides to the top and backsplashes.

MORE RESOURCES

FREE VIDEOS

- Learn our two-cut method for perfect-fitting dadoes on the tablesaw at: woodmagazine.com/deadondado.
- Handle sheet goods the easy way with tips at: woodmagazine.com/sheetgoods.
- Break down sheet goods easily and accurately with a circular saw or router: woodmagazine.com/straightedge.

RELATED VIDEOS

- Download Marc Adams' video "Cabinetmaking" and his other video titles by searching "Marc" at: woodmagazine.com/betterwoodworking. $

$ = Download these videos for a fee.

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
Face frame						
A	stiles	¾"	2"	35¼"	O	2
B	upper rails	¾"	2"	32"	O	2
C	lower rail	¾"	3"	32"	O	1
D	door divider	¾"	2"	21¾"	O	1
E	drawer divider	¾"	2"	4"	O	1
Drawers						
F	fronts/backs	⅝"	3"	13¼"	P	4
G	sides	⅝"	3"	21"	P	4
H	bottoms	¼"	13 3/16"	20 3/16"	BP	2
I	faces	¾"	5"	16"	O	2
Doors						
J	stiles	¾"	2½"	22¾"	O	4
K	rails	¾"	2½"	11¾"	O	4
L*	panels	¾"	11½"	18¼"	EO	2
Carcase						
M	sides	¾"	23⅝"	35¼"	OP	2
N	bottom	¾"	23"	34½"	OP	1
O	back	¼"	34½"	30½"	OP	1
P	bottom cleat	¾"	¾"	34"	O	1
Q	back cleat	¾"	34"	7"	OP	1
R	top cleats	¾"	1¾"	34"	O	2
Base and top						
S	fillers	¼"	1½"	23¼"	O	4
T*	base front	¾"	3½"	37½"	O	1
U*	base sides	¾"	3½"	24¾"	O	2
V	top	¾"	24¼"	36½"	OP	1
W*	front trim	¾"	¾"	38"	O	1
X*	side trim	¾"	¾"	25"	O	2
Y	backsplash	¾"	3½"	36"	O	1
Z	splash sides	¾"	2½"	22"	O	2

*Parts initially cut oversize. See the instructions.

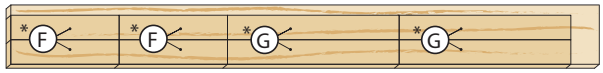
Materials key: O–oak; P–poplar; BP–birch plywood; EO–edge-glued oak; OP–oak plywood.
Supplies: ⅜" dowels (20); #8×¾", #8×1¼", #8×1½", #8×2½" flathead wood screws; 22" bottom-mount epoxy-coated roller slides (2 pr.); ½" overlay 35mm European hinges (4); ½" rubber bumpers (8); door knobs (2); drawer knobs (2).
Blade and bits: Stack dado blade; cope-and-stick, raised-panel, 45° chamfer, ⅛" round-over, ⅜" round-over router bits; ⅜" drill bit; 1⅜" Forstner bit.

Source

Rubber panel spacers: Space balls no. 142284, $5.99 [pack of 100], Woodcraft, 800-225-1153, woodcraft.com.
Toggle clamp: 2¾×4" vertical toggle clamp no. 143934, $11.99, Woodcraft.

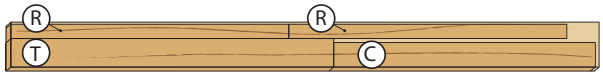
Cutting Diagram

¾ x 7¼ x 96" Oak (5.3 bd. ft.) *Plane or resaw to thicknesses listed in the Materials List.

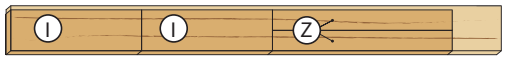


¾ x 7¼ x 72" Poplar (4 bd. ft.)

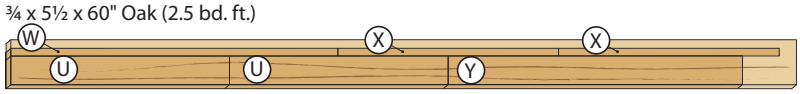
¾ x 5½ x 96" Oak (4 bd. ft.) (2 needed)



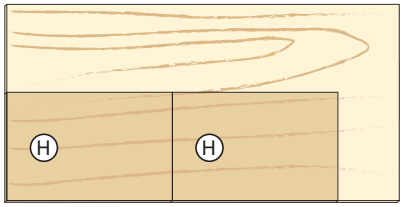
¾ x 5½ x 72" Oak (3 bd. ft.)



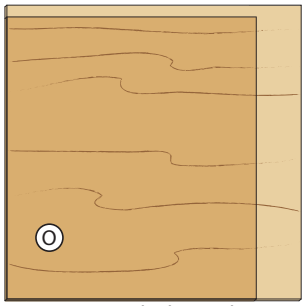
¾ x 5½ x 60" Oak (2.5 bd. ft.)



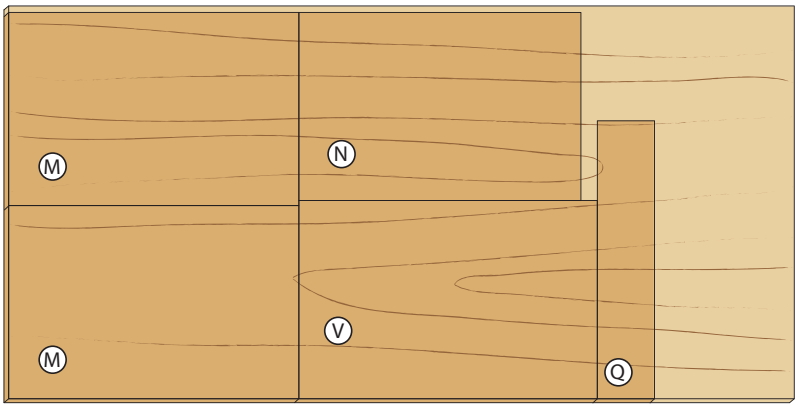
¾ x 5½ x 96" Oak (4 bd. ft.)



¼ x 24 x 48" Birch plywood



¼ x 36 x 36" Oak plywood



¾ x 48 x 96" Oak plywood

Center the top (V–Z) side-to-side on the carcase and flush at the back. Drive #8×1¼" flathead wood screws through the top cleats (R) into the top.

Install the drawer knobs, centering them on the drawer faces. Position each door knob so its top edge aligns with the bottom of the top door rail (K).

Remove the hardware and the splash (Y, Z) and apply a stain (if desired) to the outside surfaces, and a topcoat to all surfaces.

Produced by **Craig Ruegsegger** with **Marc Adams** and **Jeff Mertz**
Project design: **Marc Adams; Jeff Mertz**
Illustrations: **Roxanne LeMoine; Lorna Johnson**

SAVE When You Grow A Zoysia Lawn From Plugs!

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To A Fabulous Lawn
ZOYSIA FARM NURSERIES
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To ensure best results, we ship you living sheets of genuine Amazoy™ Zoysia Grass, harvested direct from our farms. Plugs are not cut all the way through. Before planting, simply finish the separation by cutting 1"-sq. Plugs with shears or knife. Then follow the included easy instructions to plant Plugs into small plug holes about a foot apart. Our guarantee and planting method are your assurance of lawn success backed by more than 5 decades of specialized lawn experience.

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No more pulling out weeds by hand or weeds sprouting up all over your lawn. Zoysia Plugs spread into a dense, plush, deep-rooted, established lawn that drives out unwanted growth and stops crabgrass and summer weeds from germinating.

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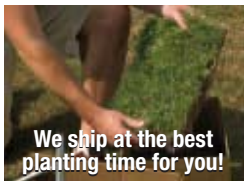
Many established Zoysia lawns only need to be mowed once or twice a season. Watering is rarely, if ever, needed – even in summer!



Meyer Zoysia Grass was perfected by the U.S. Gov't, released in cooperation with the U.S. Golf Association as a superior grass.

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When ordinary lawns brown up in summer heat and drought, your Zoysia lawn stays green and beautiful. The hotter it gets, the better it grows. *Zoysia thrives in blistering heat (120°)*, yet it won't winter-kill to 30° below zero. It only goes off its green color after killing frosts, but color returns with consistent spring warmth. Zoysia is the perfect choice for water restrictions and drought areas!

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❑	200	+ 100	–	*$ 26.85*	**$17.90**	$ 5.00	30%
❑	400	+ 200	**Free** Step-on Plugger	*$ 62.65*	**$35.80**	$ 7.50	40%
❑	500	+ 300	**Free** Step-on Plugger	*$ 80.55*	**$44.75**	$10.00	42%
❑	600	+ 400	**Free** Step-on Plugger	*$ 98.45*	**$53.70**	$12.50	44%
❑	900	+ 700	**Free** Amazoy Power Auger	*$ 168.15*	**$80.55**	$15.00	50%
❑	1000	+ 900	**Free** Amazoy Power Auger	*$ 195.00*	**$89.50**	$17.50	54%

❑ Extra Step-on Plugger **$8.95** + $3 Shipping ❑ Extra Amazoy Power Auger™ for 3/8" Drill **$24.95** + $5 Shipping

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Write price of order here $_____.____
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SHOP TESTED

Oscillating Multi-tools

They saw, sand, scrape, and more. Is it time to add one to your tool box?

You've seen the TV infomercials where these tools tackle a variety of DIY jobs: scraping adhesive, breaking out tile grout, cutting through pipes, bolts, and drywall. We tested 10 multi-tools and found that, at times, nothing else works as well or as fast.

How they work

Whether corded or cordless, an oscillating multi-tool vibrates a blade or other attachment back and forth in a narrow arc (3–4°) at up to 21,000 strokes per minute. Because of the tool's short range of blade motion, small front-end profile, and blades that extend past the snout of the tool, it reaches into tight spots other tools can't. A multi-tool also works well for flush cutting because the stepped profile of many blades and other attachments allows the attachment to rest flat on a surface.

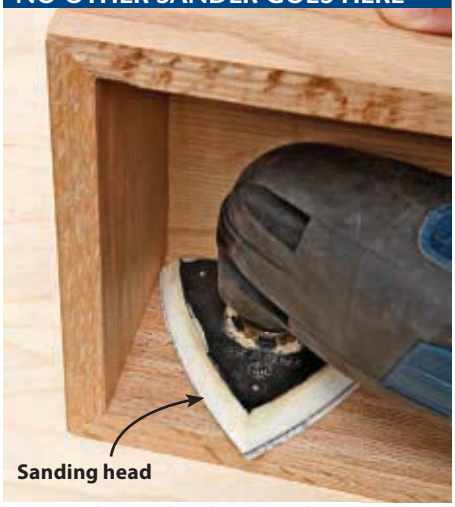
Uses in the woodshop

For woodworkers, we found the detail-sanding heads, *below*, the most useful attachments. They sand small project parts and fit in tight quarters—but don't plan on smoothing a large panel with a multi-tool.

With a wood-cutting blade installed, you can make plunge cuts in the middle of a panel to create a cord pass-through in a desktop or cabinet back; trim plugs or splines nearly flush to a surface; and cut away sections of baseboard to install built-in cabinets. For such tasks, the aggressive teeth of the wood-specific blades cut slightly quicker than the combination wood- and metal-cutting blades, but left rougher surfaces. So we prefer the cleaner cuts, ease of control, and smoother cut edges left by the combination blades. The trade-off: burning if you get impatient and push the blade too quickly.

We were surprised to find that even when a blade jammed in a tight spot, no motor ever bogged down; instead, the oscillating motion transferred to the tool body, vibrating the operator's arm.

NO OTHER SANDER GOES HERE



A triangular sanding head reaches into corners like those on this narrow drawer. Soft edges prevent marring adjacent surfaces.

What to look for

■ ***Comfortable grip.*** Because you typically wrap one or both hands around the tool's barrel, its circumference and shape determine how well the tool fits in your hand, *opposite page, top*. Circumferences under 7" suit small hands best. (See **Circumference at grip** in the chart on *page 68*.)

The extra weight of the Fein Multi-Master 250Q—at 4 lbs 1 oz it was nearly twice as heavy as most other models—

GET A GRIP THAT FITS

With a test-largest circumference near 8", the Fein, *left*, is a handful. The cordless Rockwell, *right*, has the smallest circumference.

helps it sand quickly, but made it tiring to hold during extended use. It also felt back-end heavy, making it challenging to keep it level and avoid dishing.

■ ***Minimal vibration.*** The Bosch Multi-X runs smoothest; the Ridgid JobMax buzzes most, probably due to play in its removable head. (The JobMax body accepts drill, auto-hammer, impact driver, and ratchet heads.) Fein's MultiMaster runs loudest when cutting (106 dB), while the Rockwell RK2514K2 goes easiest on the ears at all speeds, registering 62 dB running at low speed, and 93 dB during a cut at high speed.

Further smoothing things out, the Fein and the Dremel Multi-Max 6300 and 8300 feature soft-start motors that ease the tool up to speed and prevent it from jerking to the side when switching on the power.

■ ***Variable speed.*** Slower speeds make delicate sanding jobs more manageable. Cutting and grinding work best at the highest speeds. Every tool except the cordless Craftsman 17438 offers variable-speed control.

■ ***Quick accessory changes.*** With as many attachments as these tools accept, swapping them becomes a common task. Fein's toolless system, shown on the *next page*, takes only seconds. All others, except the Dremel models, require completely removing the retaining bolt with a supplied hex wrench. However, by using Dremel's adapter (see **The Fit Can Give You Fits**, *above*), any tool benefits from the Dremel blades' unique mounting, shown on the *next page*.

Before purchasing a multi-tool, find out if the attachments your local retail-

THE FIT CAN GIVE YOU FITS

With so many multi-tool manufacturers, each with its own mounting system, attachments aren't always interchangeable from brand to brand. As you can see in this chart, Dremel tools accept only Dremel attachments (unless you purchase Bosch's adapter, *bottom*), while Milwaukee (*below*) and Ridgid accept attachments from any other maker using a provided adapter.

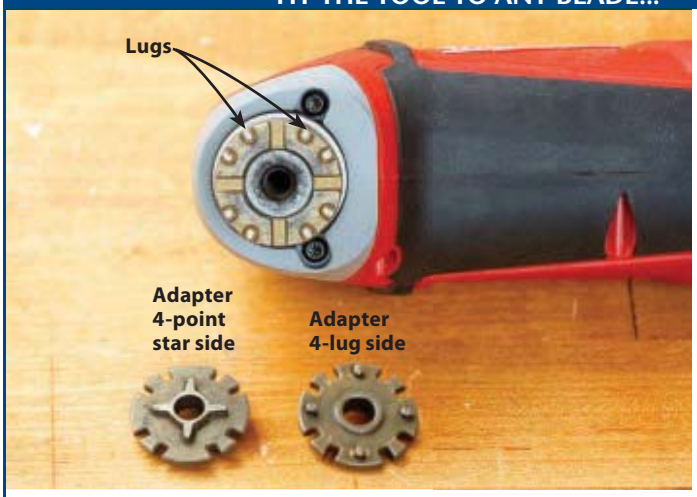
Taking a different tack, Bosch and Dremel recently introduced universal adapters (*bottom* photo). Instead of adapting the other guys' attachments to fit Bosch or Dremel tools, the adapters allow all current multi-tools to accept either the Bosch or Dremel attachments.

	ATTACHMENT MANUFACTURER*					
TOOL MANUFACTURER	BOSCH	CRAFTSMAN	DREMEL	FEIN	RIDGID	ROCKWELL
BOSCH Multi-X	F	–	A/D	A	–	–
CRAFTSMAN Multi-Tool	B	F	D	F	F	F
DREMEL Multi-Max	B	–	F	–	–	–
FEIN MultiMaster	B	F	D	F	F	F
MILWAUKEE	F	A	A/D	A	A	A
RIDGID JobMax	A/B	F	A/D	F	F	F
ROCKWELL SoniCrafter	B	–	A/D	–	F	F

A = Fits with adapter included with tool
B = Fits using Bosch adapter
D = Fits using Dremel adapter
F = direct fit
– = does not fit

* Milwaukee does not sell individual attachments.

FIT THE TOOL TO ANY BLADE...



The Milwaukee tool uses 10 lugs molded around its head and a two-sided adapter to match every blade-mounting configuration.

...OR FIT THE BLADE TO ANY TOOL

Owners of any multi-tool can increase their choices to include Bosch or Dremel attachments by using Bosch's two-sided adapter or Dremel's single-sided adapter.

CHANGE ATTACHMENTS QUICKLY

Lifting a lever on the Fein MultiMaster releases the retaining bolt. Seat the blade, press the bolt in, then flip the lever back down.

U-SHAPE FOR EASIER MOUNTING

The open end of the Dremel attachments allows you to slide them in place without fully removing the retaining bolt.

ers carry fit that tool. A local supplier provides more convenience, and often lower cost, than ordering attachments online.

■ ***Task lights.*** Because multi-tools work well in tight quarters, such as inside a cabinet, we appreciate the LED task lights on the Craftsman 17438 and 23465, Ridgid, and cordless Rockwell.

These tools make the cut

If you do much built-in work or installation, you'll love a tool like this. Likewise, if you have lots of general repair and renovation jobs around the house. We found these tools handy for some sanding and cutting jobs in the woodshop, too.

The tank-like construction, good dust collection, and quick-change accessory mount of the Fein MultiMaster 250Q earn it our overall Top Tool award. However, it can be a handful, literally, and requires a fine touch to get good results. The Bosch Multi-X earns Top Tool among the cordless versions. It's best for users who want a lighter, smooth-running tool with cordless convenience. The Craftsman 23465, at just $80, is our Top Value. Steer clear of the cordless Craftsman 17438. Its slow fixed speed takes longer to do jobs, and it comes with just one battery (as does the Ridgid), so you'll have to wait for a recharge.

Bosch Multi-X PS50-2B $200
877-267-2499, boschtools.com

Craftsman Multi-Tool 17438 $100
800-383-4814, craftsman.com

Craftsman Multi-Tool 23465 $80
800-383-4814, craftsman.com

Dremel Multi-Max 6300 $100
800-437-3635, dremel.com

GOOD VIBRATIONS:

BRAND	MODEL (KIT)	TOOL DIMENSIONS: LENGTH	TOOL DIMENSIONS: CIRCUMFERENCE AT GRIP	NO-LOAD STROKES PER MIN (x1,000)	BLADE CHANGE (1)	DUST-PORT SIZE (INSIDE DIAMETER)	TASK LIGHT (YES, NO)
BOSCH MULTI-X	PS50-2B	11¼"	6½"	5–20	H	NA	N
CRAFTSMAN MULTI-TOOL	17438	9¾"	6⅞"	15 only	H	1¼"	Y
	23465	10⅜"	7⅜"	11–19	H	1¼"	Y
DREMEL MULTI-MAX	6300 (-05)	9½"	7⅛"	10–21	H	NA	N
	8300 (-01)	10⅛"	6 15/16"	3–21	H	NA	N
FEIN MULTIMASTER	FMM 250Q (Select Plus)	10"	7⅞"	11–20	T	1⅛"	N
MILWAUKEE	2426 (-22)	11"	6¾"	5–20	H	NA	N
RIDGID JOBMAX	R82235	11½"	6⅜"	0–20	H	NA	Y
ROCKWELL SONICRAFTER	RK2514K2	11¼"	6¼"	5–20	H	1¼"	Y
	RK5101K (37-pc. professional)	10⅝"	7¾"	11–20	H	1⅛"	N

NOTES

1. (H) Hex wrench
   (T) Toolless
2. A Excellent
   B Good
   C Fair
   D Poor
   NA Not Applicable
3. (A) Straight wood blade
   (B) Semicircular wood blade
   (C) Straight bi-metal blade
   (D) Semicircular bi-metal blade
   (E) Semicircular grout blade
   (F) Triangular grout blade
   (G) Scraper blade

Dremel Multi-Max 8300 $150
800-437-3635, dremel.com

Milwaukee 2426 $149
800-729-3878, milwaukeetool.com

Rockwell SoniCrafter RK2514K2 $170
800-514-7625, rockwelltoolsdirect.com

Fein MultiMaster FMM 250Q $329
800-441-9878, fein.com

Ridgid JobMax R82235 $100
866-539-1710, ridgid.com

Rockwell SoniCrafter RK5101K $140
800-514-7625, rockwelltoolsdirect.com

GET A GRIP ON OSCILLATING MULTI-TOOLS

	PERFORMANCE GRADES (2)																				
		SEMICIRCULAR BLADE PLUNGE CUT			STRAIGHT BLADE PLUNGE CUT		FLUSH CUTTING		SANDING	GRINDING TILE GROUT		CUTTING #8 COMMON NAILS					BATTERIES				
	VIBRATION	SPEED	LACK OF TEAR-OUT	ABSENCE OF BLADE DEFLECTION	SPEED	LACK OF TEAR-OUT	ABSCENCE OF BLADE WANDER	LACK OF TEAR-OUT	ABSENCE OF SANDING MARKS	SPEED	ABSENCE OF NICKS IN TILE	SPEED	DUST-COLLECTION EFFICIENCY	INCLUDED ACCESSORIES (3)	TOOL WEIGHT (LB-OZ)	NOISE LEVEL UNDER LOAD (in dB) (4)	CORD LENGTH (IN FEET)	NUMBER INCLUDED (5)	CHARGE TIME (MIN.)	WARRANTY (YEARS) (6)	COUNTRY OF ASSEMBLY (7)	PRICE (8)
	A-	A	B	A	A	B	A-	B	A	A	C	A	NA	A–E, G, H, I (24), K	2-2	97	NA	2	30	3*	M	$200
	B	B-	B	A	C	C	B	C	B	B-	A	D	B	A, B, D, G, H, I (9), J, L	1-13	100	NA	1	45	1	C	$100
	B+	B-	B	A	B	B	A	A	B	B	A	A	C	A, B, D, G, H, I (9), J, L	2-11	100	8	NA		1	C	$80
	B+	B	B	B-	C	C	A	A	B	B	A	A	NA	A, B, H, I (3), K	1-15	98	6	NA		2	X	$100
	B+	B-	B+	A	B	B	A	B+	B	B	A	A	NA	A, B, H, I (3), K	1-13	102	NA	2	60	2	X	$150
	B	A	A	A	A	D	B	B	B	A	C	A	A	A, B, C, E, G, H, I (20), J, K, M (2)	4-1	106	16	NA		1, 3*	G	$329
	B	B	A	A	B	B+	A-	A-	B	A	B	A	NA	A, H, I (5), L	2-3	103	NA	2	30	5	C	$149
	C+	B	A-	B	B	B+	A-	A	B-	B	A	A	NA	C, D, H, I (5), L	2-4	98	NA	1	30	3, LIFETIME*	C	$100
	B	B-	A-	B	B	B+	A	A	B	B	A	A	A	A–C, E, G, H, I (20), L, M	2-3	93	NA	2	30	2	C	$170
	B+	B-	A-	A	B	C	A	A	B	B-	A	B	A	B, C, E, G, H, I (30), L	3-10	95	10	NA		2	C	$140

(H) Triangular sanding pad(s)
(I) Sanding sheets (qty.)
(J) Triangular carbide rasp
(K) Hard-shell case
(L) Soft case
(M) Accessory box for attachments

4. Every increase or decrease of 3dB is a doubling or halving of perceived volume.

5. All 12-volt lithium-ion

6. *Register for warranty of this length.

7. (C) China
(G) Germany
(M) Malaysia
(X) Mexico

8. Prices current at time of article production and do not include shipping, where applicable.

Produced by **Craig Ruegsegger** with **Matt Seiler**

Scrollsawn Dinosaur Puzzle

Park Jurassic in front of a youngster and watch his or her imagination go into high gear. It's dino-mite!

PROJECT HIGHLIGHTS

- Overall dimensions are 22" wide × 5½" deep × 6¾" high.
- Learn how to scrollsaw perfectly fitted parts from two different wood species at the same time.

1 Edge-glue a panel for the volcanoes (A) blank. Then, paying attention to grain orientation, cut blanks for parts B–H and cut the base (I) to size [**Materials List**]. Sand the blanks to 180 grit.

2 Make four photocopies of the tree (B/C) pattern on the *WOOD Patterns*® insert and one copy each of the patterns for the volcanoes (A) and the dinosaurs (D, E, F, G, H). Apply the patterns to blanks using spray adhesive, noting the grain orientation shown. Using a #2 scrollsaw blade, cut the outlines of parts A, D, E, F, G, and H.

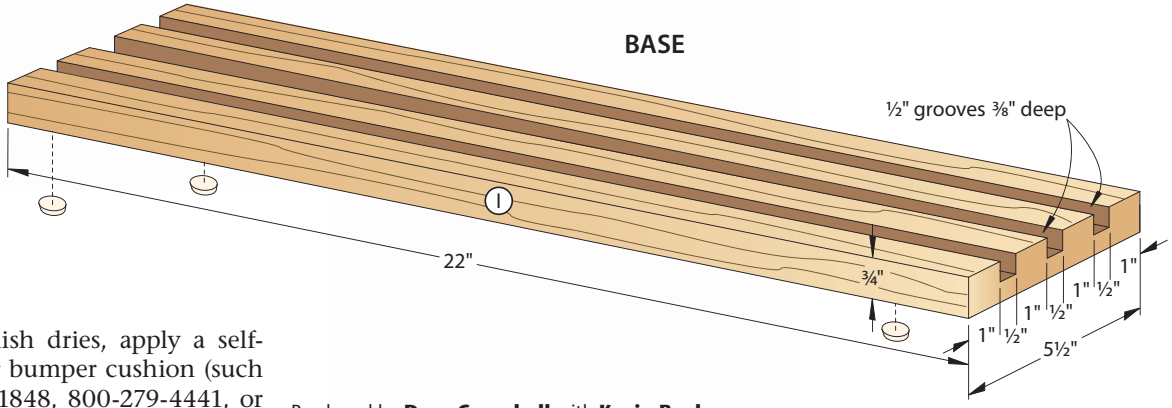
3 Now rough-cut the treetops (B) along the edge where they join the trunks (C). For each tree (B/C), attach a treetop blank to a trunk blank with double-faced tape [**Photo A**], and scrollsaw the shape of the trees.

4 Switch to a #2/0 blade for a close fit between the puzzle pieces. Drill and cut the dinosaurs and volcanoes. Then scrollsaw the individual puzzle parts where shown on the patterns.

5 Cut ½" grooves ⅜" deep in the base (I) where shown. Sand the base to 180 grit, touch-up-sand the figures as needed and apply three coats of clear finish. (We used spray lacquer, sanding between coats with 320-grit sandpaper.)

CUT TWO-THICK FOR PERFECT FIT

Align the patterns on the treetop (B) and tree trunk (C), then stack-cut both pieces to shape. Keep them together until you finish cutting the lobe that connects the two parts.



6 After the finish dries, apply a self-sticking door bumper cushion (such as Rockler no. 31848, 800-279-4441, or rockler.com) to each of the bottom four corners of the base.

Produced by **Dave Campbell** with **Kevin Boyle**
Project design: **Roxanne LeMoine**
Illustrations: **Roxanne LeMoine**; **Lorna Johnson**

Materials List

Part*		FINISHED SIZE T	W	L	Matl.	Qty.
A	volcanoes	½"	6"	15¾"	W	1
B	treetops	½"	1¾"	3¼"	P	2
C	tree trunks	½"	1"	4½"	W	2
D	Apatosaurus	½"	4½"	13½"	P	1
E	Tyrannosaurus	½"	5"	7¾"	W	1
F	Dimetrodon	½"	5¼"	3¼"	Z	1
G	Triceratops	½"	3½"	5¾"	M	1
H	Stegosaurus	½"	4"	6"	L	1
I	base	¾"	5½"	22"	M	1

*All part dimensions, except for the base (I), are for blanks to be scrollsawn.

Materials key: L–lacewood, M–mahogany, P–poplar, W–walnut, Z–zebrawood.
Supplies: Spray adhesive, double-faced tape, door bumper cushions (4).
Blades and bits: ½" dado set or straight router bit, #2 and #2/0 scrollsaw blades, 1/16" drill bit.

SHOP TIP

Start by becoming a Scrapwood Selectosaurus

You can craft this puzzle mostly out of pieces from your scrap bin, but being selective about the scraps you choose elevates the project from good to great. For example, we took advantage of a streak of light-colored sapwood in the walnut to make the tall volcano look snow-capped. The ray flecks in the lacewood suggest the "armor" that jackets a Stegosaurus. And the bold stripes of the zebrawood help create the illusion of the ribs on the "fin" of the Dimetrodon, as shown *here*.

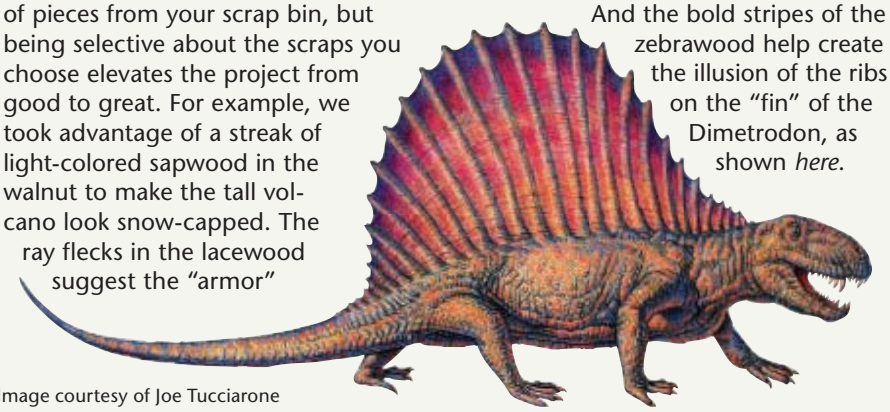


Image courtesy of Joe Tucciarone

Easy Sliders

How to choose the right drawer slides and mount them for smooth results.

Some woodworkers avoid drawers in their projects because they perceive them to be difficult to install. Truth is, once you know a few tricks, you'll soon be installing drawers with ease. In this article, you'll learn about three common types of tandem (two-piece) drawer slides frequently found on *WOOD*® magazine projects. We'll demonstrate on face-frame cabinets, which typically require mounting brackets at the rear of the slides and sometimes at the front. These slides install even easier in frameless cabinets.

Before building the cabinet or drawer boxes, purchase your drawer slides, or at the least know their dimensions and mounting criteria. Then build the cabinet to suit the slides. Your drawer boxes *must* be flat with square corners.

Nearly all side-mount slides, when coupled together, measure ½" thick. So when sizing your drawer boxes, allow ½" of space between the drawer side and cabinet. (Bottom-mount slides typically measure ⅜" thick; see instructions on *page 75* for these.) If you're using a bracket to attach the slides to the rear of the cabinet, reduce the drawer's length so it doesn't hit the bracket when closed.

Epoxy-coated roller slides: low cost and easy to find

Why choose these?

- Typically less than $10 per pair, and available in most home centers.
- Because the drawer-mount members wrap around the drawer side's face and bottom edge, they're nearly impossible to install incorrectly.
- More forgiving than other slides if the mating slides don't align precisely, because the slide track has wiggle room for the plastic wheels to move side-to-side about 1/16".
- With no lubricant needed, they're ideal for dusty applications, such as shop cabinets.

For ease of installation, we attached the slide to the back of the cabinet with a standard mounting bracket. (These sell for about $2 a pair.) Start by separating the drawer slide into its two parts: the cabinet-mount member and the drawer-mount member.

Attach to the cabinet first

1 Rest the cabinet-mount member on the cabinet's face frame, 1/32" back from the front face. You can use an accessory device for holding the slide in position [**Photos A, B**], or simply hold it freehand, aligning it in the next step. Drill a pilot hole and drive one screw into the face frame.

2 Measure the gap between the slide and the cabinet side to ensure you mount it perpendicular to the face-frame opening [**Photo C**].

3 Drive a screw into one of the horizontal slots on the rear mounting bracket [**Photo D**].

4 Repeat Steps 1–3 for the other side of the drawer opening.

Now mount to the drawer

1 Install the drawer-mount member on the drawer side, keeping it 1/32" back from the drawer front. [**Photo E**]. Repeat for the other side of the drawer.

2 Insert the drawer into the cabinet-mounted slides and test its fit. If the drawer binds, loosen the screw on the rear mounts and adjust the bracket side-to-side until the drawer slides smoothly.

3 Use a straightedge to check the drawer front's fit to the face frame [**Photo F**]. If you need to adjust the drawer up or down, first drive a screw in the center of the rear-brackets' vertical slot. Remove the screw from the horizontal slot, make the necessary adjustments up or down, and reattach it with a screw in the horizontal slot.

4 Once the drawer front aligns with the face frame and the drawer slides smoothly, drive the remaining screws to secure the slides in place.

(If you've built inset drawers, the drawer front will be the finished face. If you'll attach an overlay drawer front to the drawer box's front, do this after installing and aligning the drawer slides.)

START AT THE FACE FRAME

A

Hold the slide perpendicular to the face frame—we like Kreg's magnetic mounting tool, shown—while attaching with screws.

HERE'S ANOTHER WAY

B

If your cabinet is sitting on a level surface, you can line up your slides by temporarily taping a torpedo level to the bar.

KEEP IT PARALLEL

C

Measure at the front and rear of the cabinet to make certain the slide runs parallel to the cabinet side.

SECURE THE REAR BRACKET

D

A single screw in the horizontal slot allows you to make slight side-to-side adjustments after mounting the opposing slide.

SCREW THE SLIDE TO THE SIDE

E

Drive an included screw nearest the front of the drawer first; then add a second one at the rear of the slide.

AIM FOR A FLUSH-FIT DRAWER

F

If your drawer has a gap like this, loosen the rear mounting brackets and adjust the slides down until the gap disappears.

Source:

Magnetic drawer slide mounting tool: #NZ03, $30, Kreg Tool Company, 800-447-8638, kregtool.com.

Ball-bearing slides: built for heavy loads

Why choose these?

- Ideal for drawers with hefty contents, such as silverware or tools.
- Full-extension range allows the drawer to open fully for best access to contents in the back. Less-costly, ¾ extensions open to expose all but the back fourth of the drawer. Installation is the same for each style.
- Lubricated bearings make for the smoothest sliding action.
- Typical ball-bearing slides sell for about $8 to $25 per pair. Additional features, such as self-closing mechanisms or higher weight ratings, increase this cost.

Mount to the drawer first

1 Begin by attaching the drawer-mount member. With the slide aligned flush to the drawer front and bottom edge, attach with a screw at the front in a vertical slot [**Photo G**], and then add one at the rear.

2 Repeat for the other side of the drawer; then separate the cabinet-mount portions of the slides.

Now for the cabinet

1 With the cabinet-mount member clipped into its front mounting bracket (about $1 apiece), seat the bracket's wrapped shoulder snugly against the back of the face frame for the correct offset [**Photo H**].

2 Tape a torpedo or any short level onto the slide—or use one with a magnet that will grip the slide—and use it to align the slide up or down. (The cabinet must be shimmed level for this to be accurate.) Measure the gap between the slide and cabinet side to ensure the slide mounts parallel to the cabinet side.

3 Secure the rear mounting bracket ($1.50 each) to the cabinet [**Photo I**].

4 Slide the drawer into the cabinet mounts until the catches lock. To adjust the fit, use the same techniques from Step 4 of the roller slides.

5 Drive the remaining screws to secure the slides in place.

START WITH THE DRAWER MOUNT

G

With the slide still joined together, align it with the bottom edge of the drawer side. Slide it back to reveal a screw slot and drive a screw.

FASTEN TO THE FACE FRAME

H

With the bracket resting on the face frame, hold the slide as level as possible, and then secure it with two screws in the frame.

ATTACH THE BACK END

I

Use a self-centering bit to drill pilot holes and then drive a screw into the center of the horizontal slot to allow for adjustment later.

Bottom-mount slides: completely hidden from view

Why choose these?

- The mounting position allows you to make drawers nearly the full width of the drawer opening—minus ⅛" on each side, netting more storage space than with other slides.
- Using a single slide ($8 to $20 per pair) in the center of the drawer reduces hardware costs.

When you use only one slide per drawer, you reduce the weight-carrying capacity to less than half that of a similar drawer with two slides. (Single bottom-mount slides typically rate for 25-pound capacity.) In order for the mounting screws to hold, you'll need to make your drawer bottoms ½" thick, or add a spacer—shown on the bottom drawer on *page 72*—if using thinner bottoms. Most bottom-mount slides are ⅜" thick, but leave 5/16" under your drawer bottom for mounting. The extra 1/16" provides clearance between the drawer sides and the face frame after mounting.

Attach to the drawer first

1 For inset drawers, align the slide flush with the drawer front and centered across its width. If your drawers will have an overlay front, notch the drawer box **[Photo J]** so the slide sits flush with the front face of the drawer box.

2 Center the slide and attach it with screws at the front and back **[Photo K]**.

Add the cabinet mount

1 Install the slide to the face frame, securing it with one screw **[Photo L].** For inset drawers, first attach a mounting block ¾" thick inside the face frame to which you can screw the slide.

2 Attach the slide to the rear of the cabinet with a mounting bracket, making sure it is square to the face frame. If your cabinet has a dust frame, you can mount the slide to it rather than the back.

OPEN A PASS FOR THE SLIDE

Cut the notch for the slide at least ⅛" wider on each side, to the depth of the drawer bottom. Then chisel out the waste.

AIM FOR THE CENTER

With one screw holding the front of the slide in place, measure from the drawer side to make sure the slide sits centered and parallel.

SET BACK AND IN THE MIDDLE

Mount the slide 1/32" back from the front of the face frame. You might need to angle the screw slightly to avoid the frame above.

3 To help support the drawer, add nail-in or self-adhesive glide pads to the face frame where the drawer-side bottom edges will pass **[Photo M]**.

A SMOOTHER RIDE

Glide pads not only prevent the drawer from rocking on a single slide, but they also make for smoother operation.

Produced by **Bob Hunter** with **Kevin Boyle**

MORE RESOURCES

- Watch FREE videos on making and installing drawers, at woodmagazine.com/simpledrawers and woodmagazine.com/drslides.
- Read about a simple technique for making drawers at woodmagazine.com/easydrawers. $
- Learn for FREE how to make drawer-lock joints on your tablesaw at woodmagazine.com/lockrabbet.
- Or, get a FREE article on making lock-rabbet drawer joints on your router table at woodmagazine.com/drawerlockbit.

Sources

Drawer slides and mounting brackets, available at most home centers and these retailers:

- Lee Valley, 800-871-8158, leevalley.com.
- Woodworker's Hardware, 800-383-0130, woodworkershardware.com.
- Rockler, 800-279-4441, rockler.com.
- Woodcraft, 800-225-1153, woodcraft.com.

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Dirty dust bags: Launder as a last resort

Q: The inside of my dust collector's filter bag is really gunked up with a solid layer of powdery sawdust. The collector seems to be drawing less air than it used to. Should I throw the bag into the laundry to get it clean?

—Scott Villalon, Jacumba, Calif.

A: Scott, according to the experts at American Fabric Filter Co., a fine layer of dust coating the inside surface of the bag actually works with the fibers of the filter to trap small particles. But if you notice a thick crust of dust (called "dust cake"), or you're seeing dust bleed through the filter, or you experience significantly decreased suction, it's time to act.

Before you toss the filter bag in the washer, try these steps: With the dust collector running and the bag inflated, tap the bag with your hand or a broomstick. If that doesn't clear up the cake, try blowing compressed air against the outside of the bag with the collector running. Still not getting satisfactory results? Then remove the bag, turn it inside out and vacuum any remaining dust cake, as shown *below*.

If you're still not happy with the bag's performance, the folks at American Fabric and Filter say that a spin in the washing machine could clear up any remaining problems, acting as a "reset" for the filter. (We suggest an industrial machine at your local laundromat rather than the one that normally keeps your whitie-tighties white and tight.) Turn the bag inside out, use the cold setting, and wash it on a gentle cycle with laundry detergent. Tumble-dry the bag on the air-only, no-heat setting or hang it outdoors in nice weather to dry completely before using it again.

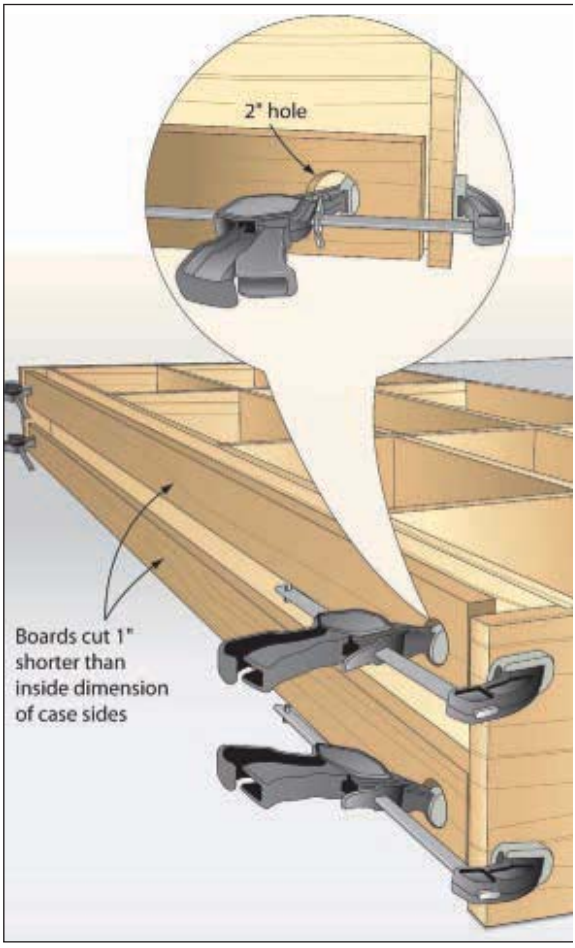
Vacuuming the inside of your dust filter bag will remove most of the built-up dust cake that can clog the fabric.

Wood strips stretch your clamp dollars

Q: I don't have many long clamps yet, but I want to tackle a bookcase for my next project. Is there a cheaper solution than dropping a lot of dough on long clamps I won't use often?

—Robert Templeman, Tampa, Fla.

A: Here's a slick trick for stretching your smaller clamps so they do the work of the big boys, Robert. Cut scrap strips of plywood just shorter than the case side that you're clamping. Drill holes at the ends using a bit or holesaw large enough to accommodate the jaws of your smaller clamps. Then, use this as a clamp stretcher as shown *below*.



continued on page 78

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Ask WOOD

Let's make a (tablesaw) deal

Q: I found a used, brand-name tablesaw for less than half the cost of new. What should I look for to make sure I'm not getting a lemon?

–Brad Bowers, Reno, Nev.

A: The price sounds right, Brad, and because it's a well-established brand, getting service and parts should prove easy.

Now do your research. Google the model number to learn about any problems other users have identified.

Many machine manufacturers archive product manuals on their Web sites. Download and print the manual and refer to it when you inspect the saw. As you make your external inspection, talk to the owner about the saw's history. Is he the first owner or did he purchase it from a high school shop? Is he a woodworker who barely had time for his hobby? This will give you an idea about the saw's "mileage."

Look out for signs of neglect or abuse. A little surface rust can be removed, but a deeply pitted table may need to be replaced or re-ground, nullifying your savings. Are there cracks or dents in the cabinet? A jolt hard enough to damage a tablesaw's casing may have damaged internal components. Don't be too shy to ask about mishaps.

Check for missing parts, such as the miter gauge, blade guard, dado insert, and blade wrenches. Mentally add up the replacement cost of any missing parts and add it to the cost of the saw. Does it still seem like a good deal? Or perhaps you've gained some negotiation room.

Now let's open 'er up. Unplug the saw and take off the blade. Rotate the arbor, then gently wiggle it up and down. If you feel any play or hear any clicking sounds it could indicate worn bearings that need replacing. Brush off the height- and bevel-adjustment gears, and check for cracked or missing teeth. Raise and lower the blade completely and tilt the bevel through its full range to ensure smooth movement.

With the blade still off, plug in the saw and fire it up. If you feel or hear any vibration, remove the belts and power up the saw again to see if the vibration continues. If so, it could be a problem with the motor or bearings. Figure in repair or replacement costs.

Finally, ask the seller if you can cut some wood with the saw to see how it handles under load. Install your own sharp blade and make multiple cuts in hardwood scrap. Does the saw bog down easily or stop completely? Feel the motor afterward. Is it hot to the touch? If so, figure in the cost of a new motor.

If, after all of this, you've decided that the tablesaw is indeed a good deal, there's one last thing to consider. Who can you bribe to help load it?

Wiggle the arbor shaft to check for any looseness. Any play could translate into a wobbly blade and poor cut quality.

Rule of thumb guides best workbench height

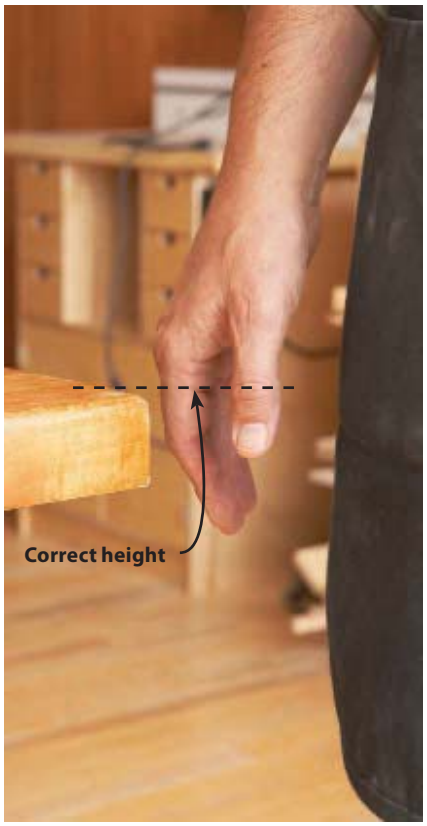
Q: I'm ready to design and build a workbench for my shop. How tall should I make the bench for comfortable woodworking?

—Samuel Johnson, Mesa, Ariz.

A: Workbench height depends largely on how your bench will be used, Samuel. The standard height of 34" matches most tablesaw heights, allowing the workbench to double as an outfeed support.

Many hand-tool woodworkers, though, prefer a bench 1 or 2 inches lower allowing more leverage for hand-plane and chisel use. If you're mainly a power-tool woodworker, adding a couple of inches may make power-sanding and assembly operations more comfortable.

To dial in a height to match your stature, use the "rule of thumb": Make your workbench height the distance from the floor to your first thumb knuckle, with your arms hanging relaxed at your sides.



A workbench sized to meet your hand at your thumb's knuckle provides a comfortable working height for a mix of power- and hand-tool woodworking.

continued on page 80

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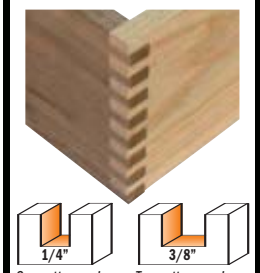

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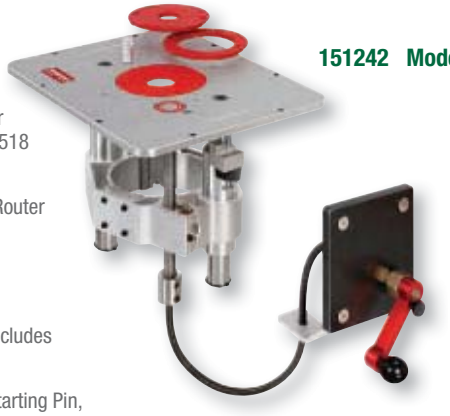

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Ask WOOD

A guide to getting grain textures in SketchUp

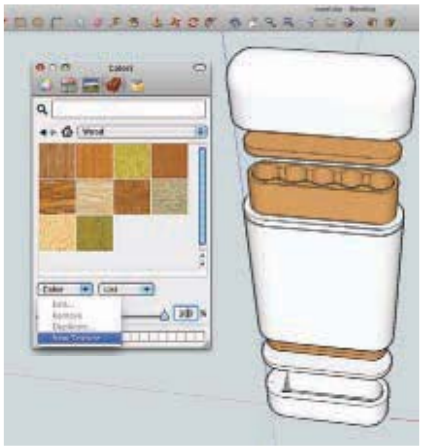
Q: I downloaded the wood grain textures for SketchUp from your Web site (woodmagazine.com/woodgrain). Can you tell me how to get those into SketchUp and then onto my project design?

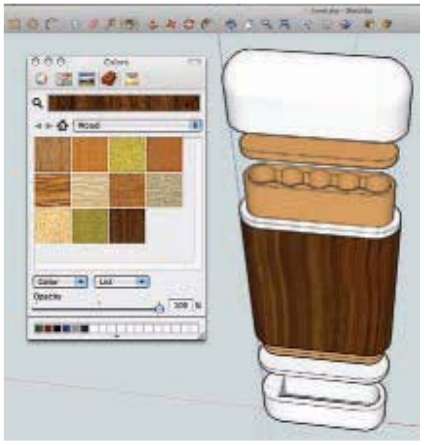
—Donald Baker, Wayne, N.J.

A: Sure, Donald. You're just a few mouse clicks away:

In SketchUp, choose Windows, then Materials to display the Materials list panel. To add the texture to the Wood list, select Wood from the top drop-down menu. Then, in the Color drop-down menu, choose New Texture, as shown *below top*. Navigate to the textures that you downloaded from our site and choose a wood image. In the dialog box that appears, type in a name for your texture and give it a scale size. (Ours are about 6×6".) Then click OK.

Now, when you choose the paint-bucket tool, your texture will be waiting for you in the materials list. Simply select the grain and click on the project part you'd like to texture, as shown *bottom*.





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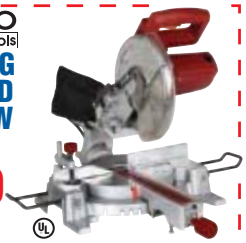

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About our product tests

We test hundreds of tools and accessories, but only those that earn at least three stars for performance make the final cut and appear in this section. Prices are current at the time of article production and do not include shipping, where applicable.

Compact cyclone proves ideal for basements

I've always wanted a cyclone dust collector for my low-ceiling basement shop, but most models simply stand too tall. Grizzly's G0703 portable cyclone measures only 65½" tall—fitting easily in my shop—and rolls around smoothly on casters. But that doesn't make the G0703 a lightweight. It's made of beefy 18-gauge steel with a 1½-hp, 110-volt motor; a respectable 695 cfm of air flow through 5" duct; and a fine-filtering, 2-micron, pleated canister that trapped all dust. I measured the noise level from 3' away and found it produced 85 decibels, loud enough to wear hearing protection. But in the ground-floor room directly above, that measurement dropped to a hardly noticeable 60dB.

I hooked up this collector to all of my stationary machines with 13' of 5" flex-hose—using the included reducer to step down the G0703's 6" inlet and another to fit the machines' 4" ports—and it cleared the dust and chips from each tool with ease.

—Tested by Jan Svec, a former WOOD® *magazine project designer, builder, and editor*

Portable cyclone dust collector, #G0703

Performance	★★★★★
Price	$850

Grizzly Industrial
800-523-4777; grizzly.com

Bosch gets a good start with pneumatic nailers

Known more for making power tools, Bosch recently jumped into the pneumatic-nailer business, and the three nailers I tested—finish, brad, and narrow-crown stapler—proved nimble and drove fasteners well. All three feature bodies smaller than comparable nailers I've used, making them lighter (by a half-pound) without sacrificing power. They all switch from single shot to sequential fire with the flip of a switch. Each has dry-fire lockout when it's out of fasteners (to prevent damage to the drive pin), tool-free depth adjustment, a narrow nose with removeable no-mar tip (that stores on the tool when not in use), and front-hinged access gate to clear jammed nails.

Although they performed like champs, I had minor problems loading fasteners. The finish nailer's rear-loading magazine proved awkward to use, and the stapler's top-loading magazine seemed flimsy and not on par with the rest of the tool. The brad nailer's side-load magazine was the easiest to use among the trio.

Bosch does not make fasteners, but I used nails and staples from four other companies with no glitches.

—Tested by Dave Fish, pro trim carpenter and cabinetmaker

Bosch pneumatic nailers

Performance		★★★★☆
Price	16-gauge finish nailer, #FNS250-16	$170
	18-gauge stapler, #STN150-18	$120
	18-gauge brad nailer, #BNS200-18	$120

Bosch
877-267-2499; boschtools.com

Finally, carbide knives for benchtop planers

We all know carbide tips on saw blades and router bits outlast steel edges, but until recently you couldn't get carbide knives for your benchtop planer. Infinity Cutting Tools' carbide-edged knives delivered about 10 times the life of new carbon-steel knife edges on my DeWalt DW735 planer. Analyzing motor-amperage draw and observed cut quality, I judged the steel knives dull after planing 48' of particleboard (chosen for its accelerated abrasive dulling effect) in each of two tests. The Infinity carbide knives planed 492' and 528', respectively, before dulling.

A set of three single-edge Infinity knives sells for $250. Five sets of double-edge disposable knives ($50 per set) would yield the same edge life, making the effective cost a wash. But you'll save yourself the hassle of nine knife changes. (Resharpening the Infinity knives isn't practical because they reference off cutterhead pins, and so their height cannot be adjusted.)

At the time of testing, Infinity had carbide-tipped knives only for DeWalt's DW735, but had plans to make them for other models.

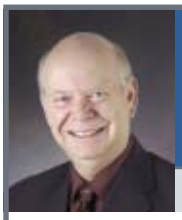
—Tested by Bob Hunter, Tools & Techniques Editor

Carbide-edged planer knives, #CPJK-041

Performance	★★★★★
Price	$250

Infinity Cutting Tools
877-872-2487; infinitytools.com

continued on page 85



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Nicholas J. Bruyer, CEO, First Federal Coin Corp.
ANA Life Member Since 1974

How can two $5 Gold Eagles have a 600% difference in value?

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Almost everyday, very successful, very sophisticated business people tell us they're interested in buying gold. The problem is, they don't have the first notion of where to begin.

Our response is always the same: there's bullion gold, and then there's collectible gold. We're not talking about bullion gold. We're talking about a special kind of gold that collectors climb all over themselves to get their hands on.

Use our Collector's Checklist when you go shopping for gold.
First on our list: *collectors look for a coin that's in demand*. And there are few gold coins that collectors want more than the American Gold Eagle. It was created during Ronald Reagan's administration.

In real estate, value is driven by location, location, location. In coins, it's quality.

For collectors, the higher a coin's grade, the higher the coin's value. That's number #2 on our checklist. One of those $5 Gold Eagles is the highest collectible grade possible: the absolutely flawless grade of MS70 (MS stands for "Mint State"). It's referred to as the "perfect" coin.

Consider this: In its bullion grade, a 2001 $5 Gold Eagle is valued at $150—but a perfect grade MS70 is valued at $950—***a staggering 600% difference***!

Of course you have to understand that the population of this MS70 coin is small, but it's an example of a coin in its finest Mint State grade.

No. 3 on our checklist: Collectors covet First Strikes.
If a $5 Gold American Eagle in MS70 is sizzling hot, what happens when it achieves the exalted status called First Strike™?

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Shop-Proven Products

Switch to a tool-triggered shop-vacuum assist

Although it's not the first accessory switch for joining a shop vacuum to a tool for one-touch activation, the iVac Switch Box goes beyond its competitors to power up to three devices simultaneously. I love it for use with my shop vacuum and my sander or router. And when I want to switch over to my router table—with a 15-amp router mounted in it—I simply plug the iVac's two power cords into separate outlets (on separate circuits), and still get the same one-switch activation for both. I tested it with every tool in my shop, adding extension cords and power strips, and did not trip a 20-amp breaker until I tried 10 tools and the vacuum simultaneously. Very cool!

—Tested by Doug Hicks,a former shop teacher and woodworking magazine editor

iVac Switch Box

Performance	★★★★★
Price	$45

M Bright Tools
613-826-2200; ivacswitch.com

Separator slows vac filter clogging

I used the latest version of Oneida's Dust Deputy extensively over several months as I framed, drywalled, and trimmed my basement, and it saved me from many shop-vacuum filter cleanings. The Dust Deputy is a mini-cyclonic separator that traps about 95 percent of all debris in its plastic bucket before it reaches the attached vac. It reduced my filter cleaning by about 80 percent.

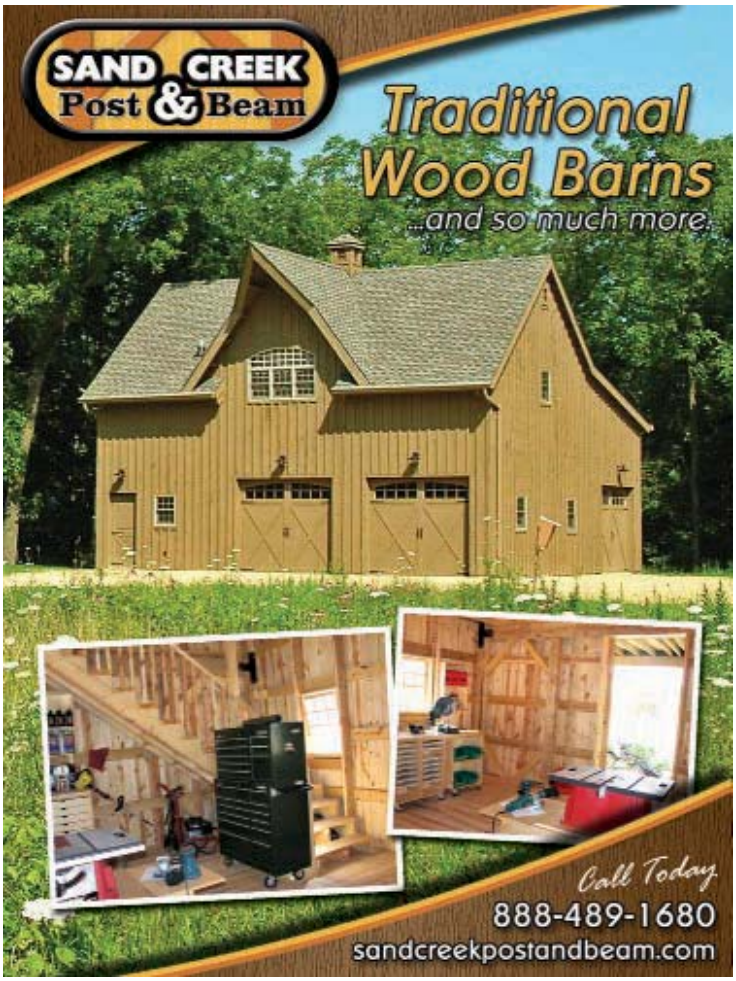
I experienced two minor hassles. First, the dust port on top of the separator was too small for my vacuum's hose, so I had to rig it together with tape. When screwed to the side of my vacuum, the Dust Deputy proves awkward to move around and tippy as it begins to fill up. If I had it to do over again, I'd mount the Dust Deputy and my vacuum to a plywood base, and then install the casters for a more stable unit that rolls easily.

—Tested by Bill Krier, Editor-in-Chief

Dust Deputy

Performance	★★★★☆
Price	$99

Oneida Air Systems
800-732-4065; oneida-air.com



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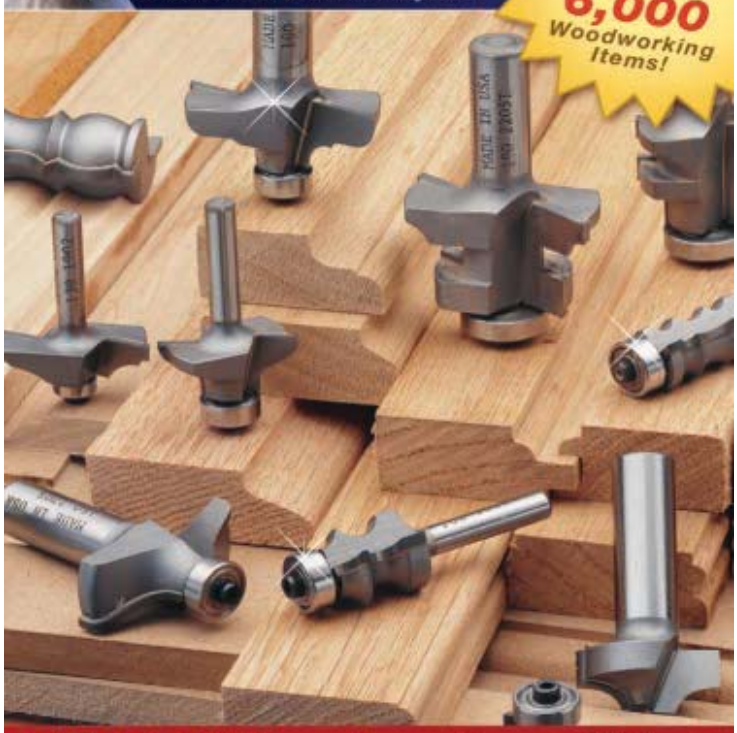

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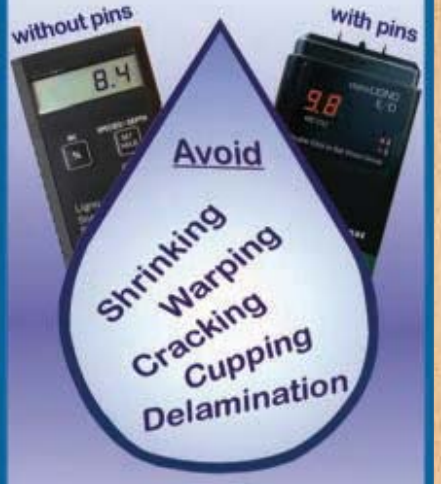

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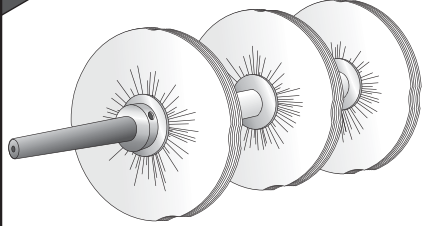

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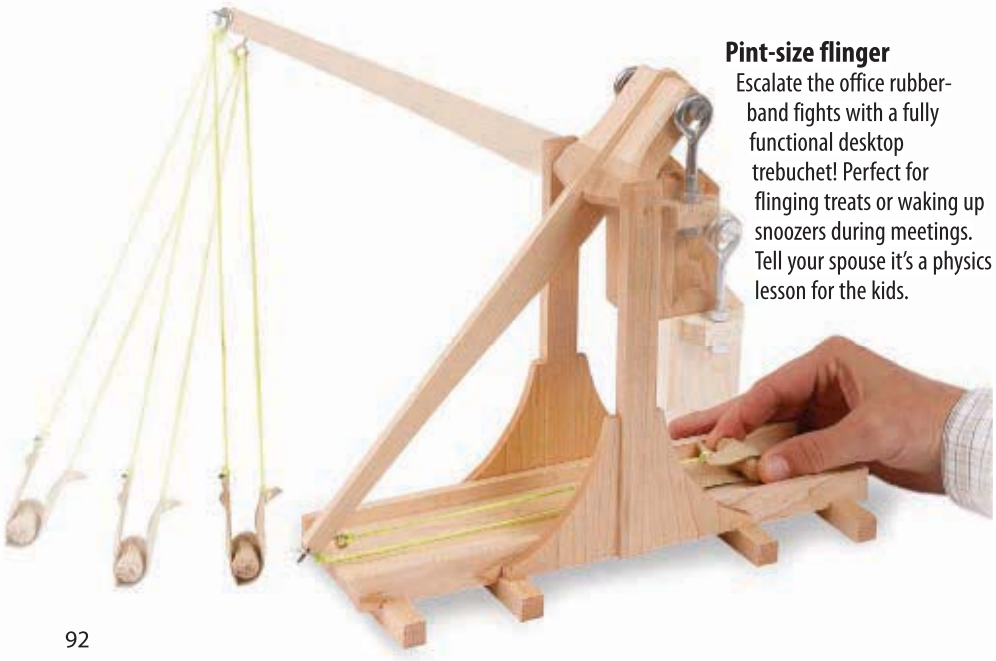

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3HP RF Remote **$99.00**

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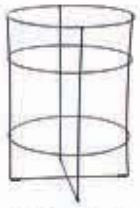

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